

ANALYSIS

This ordinance repeals those provisions of Title 28 – Plumbing Code – of the Los Angeles County Code that had incorporated by reference portions of the 2013 Edition of the California Plumbing Code and replaces them with provisions incorporating by reference portions of the 2016 California Plumbing Code, published by the California Building Standards Commission, with certain changes and modifications. Unless deleted or modified herein, the previously enacted provisions of Title 28 continue in effect.

State law requires that the County's Plumbing Code impose the same requirements as are contained in the building standards published in the most recent edition of the California Plumbing Code except for changes or modifications deemed reasonably necessary by the County because of local climatic, geologic, or topographic conditions.

The changes and modifications to requirements contained in the building standards published in the 2016 California Plumbing Code that are contained in this ordinance are based upon express findings contained in the ordinance that such changes are reasonably necessary due to local climatic, geologic, or topographic conditions.

This ordinance also makes certain modifications to the administrative provisions of Title 28.

MARY C. WICKHAM
County Counsel

BY 

CAROLE B. SUZUKI
Senior Deputy County Counsel
Public Works Division

CBS:lm

Requested: 08/23/16
Revised: 10/11/16

ORDINANCE NO. _____

An ordinance amending Title 28 – Plumbing Code – of the Los Angeles County Code by adopting and incorporating, by reference, portions of the 2016 California Plumbing Code, with certain changes and modifications, and making other revisions thereto.

The Board of Supervisors of the County of Los Angeles ordains as follows:

SECTION 1. Sections 119.1.2 through 119.1.14 of Chapter 1, Chapters 2 through 17, and Appendices A, B, D, H, I, and J, which incorporate by reference and modify portions of the 2013 California Plumbing Code are hereby repealed.

SECTION 2. Chapter 1 is hereby amended to read as follows:

CHAPTER 1

ADMINISTRATION

100 ADOPTION BY REFERENCE.

Except as hereinafter changed or modified, Sections 1.2.0 through 1.14.0 of Chapter 1, Division I of that certain Plumbing Code known and designated as the ~~2013~~2016 California Plumbing Code as published by the California Building Standards Commission, are adopted and incorporated, by reference, into this Title 28 of the Los Angeles County Code as if fully set forth below, and shall be known as Sections 119.1.2.0 through 119.1.14.0, respectively, of Chapter 1 of Title 28 of the Los Angeles County Code.

Except as hereinafter changed or modified, Chapters 2 through ~~16~~A17 and Appendices A, B, D, H, I, and J of that certain Plumbing Code known and

designated as the ~~2013~~2016 California Plumbing Code as published by the California Building Standards Commission, are adopted by reference and incorporated into this Title 28 of the Los Angeles County Code as if fully set forth below, and shall be known as Chapters 2 through 17, and Appendices A, B, D, H, I, and J of Title 28 of the Los Angeles County Code.

A copy of the ~~2013~~2016 California Plumbing Code shall be at all times maintained by the Chief Plumbing Inspector for use and examination by the public.

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103.12.2 **Alternate Materials and Methods of Construction.** In compliance with Section 301.23 of this Code regarding the use of an alternate material or method of construction, an application shall be submitted in writing to the Chief Plumbing Inspector together with a filing fee of \$231.00. When ~~actual~~ staff review exceeds two hours, an additional fee of \$115.50 per hour shall be charged for each hour or fraction thereof in excess of two hours.

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SECTION 3. Section 301.2.2 is hereby amended to read as follows:

301.2.2 **Standards.** Standards listed or referred to in this eChapter or other eChapters cover materials that will conform to the requirements of this eCode, where used in accordance with the limitations imposed in this or other chapters thereof and their listing. Where a standard covers materials of various grades, weights, quality, or configurations, the portion of the listed standard that is applicable shall be used. Design and materials for special conditions or materials not provided for herein shall be

permitted to be used only by special permission of the Authority Having Jurisdiction after the Authority Having Jurisdiction has been satisfied as to their adequacy. A list of accepted plumbing material standards is referenced in Table 1701.1. Solar thermal energy systems and material standards are referenced in Table S-17 of Appendix S. IAPMO Installation Standards are referenced in Appendix I for the convenience of the users of this eCode. They are not considered as a part of this eCode unless formally adopted as such by the Authority Having Jurisdiction.

SECTION 4. Section 301.3 is hereby amended to read as follows:

301.3 Alternate Materials and Methods of Construction

Equivalency and Modifications.

301.3.1 Alternate Materials and Methods of Construction.

Nothing in this eCode is intended to prevent the use of systems, methods, or devices of equivalent or superior quality, strength, fire resistance, effectiveness, durability, and safety over those prescribed by this eCode. Technical documentation shall be submitted to the Authority Having Jurisdiction to demonstrate equivalency. The Authority Having Jurisdiction shall have the authority to approve or disapprove the system, method, or device for the intended purpose on a case by case basis. [HCD 1] (See Section 1.8.7).

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301.3.1.1 Testing.

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301.3.1.1.1 Tests.

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301.3.1.2.1.2 Request by Authority Having Jurisdiction.

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301.3.2 Modifications. Whenever there are practical difficulties involved in carrying out the provisions of this Code, the Authority Having Jurisdiction shall have the authority to grant modifications on a case by case basis, upon application of the owner or the owner's authorized agent, provided the Authority Having Jurisdiction shall first find that a special individual reason makes the strict letter of this Code impractical and that the modification is in conformity with the spirit and purpose of this Code and that such modification does not lessen any health, fire-protection, or other life-safety related requirements. The details of any action granting modifications shall be recorded and entered in the files of the Authority Having Jurisdiction. Application for approval of a modification shall be in accordance with Section 103.12.2.

SECTION 5. Section 609.7 is hereby amended to read as follows:

609.7 Abutting Lot. Nothing contained in this eCode shall be construed to prohibit the use of all or part of an abutting or adjacent lot or lots to:

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SECTION 6. Section 721.3 is hereby added to read as follows:

721.3 Public Sewer. If the public sewer does not extend to a point from which each building on a lot or parcel of land large enough to permit future subdivision can be independently served, the property owner shall construct a public sewer as required by Title 20 – Utilities – of the Los Angeles County Code, Division 2 –

Sanitary Sewer and Industrial Waste Ordinance, to provide adequate sewerage for each such possible parcel.

EXCEPTION: When the Authority Having Jurisdiction finds that the character of a lot is such that no further subdivision can be reasonably anticipated, or the use is such as to preclude subdivision, or where the owner has executed a covenant stating that the lot or parcel of land together with all improvements thereon will be maintained as a unit and that before any subdivision is made or any portion of said lot is transferred to another owner, separate sewerage facilities as hereinbefore required in this Section will be installed, the drainage system of all buildings may be connected to a common building sewer or private sewage disposal system. The covenant shall be recorded by the owner in the office of the Department of Registrar-Recorder as part of the conditions of ownership of said property. Such agreement shall be binding on all heirs, successors, and assigns to said property.

This exception shall apply only while the whole of such lot remains in one undivided ownership. Upon the transfer of any portion of such lot other than the whole thereof to another owner, whether such transfer is made before or after the operative date of the ordinance adding this provision, the exception shall cease and a person shall not use or maintain any building or structure except in compliance with the provisions of this Code. As used in this Section, a sale, foreclosure, or contract to sell by the terms of which the purchaser is given the right of possession shall be deemed a transfer.

SECTION 7. Section 728.0 is hereby added to read as follows:

728.0 Building Sewer Connection Requirements.

728.1 Size. That portion of the building sewer extending from the public sewer to the property line shall be not less than four (4) inches (100 mm) in internal diameter.

728.2 Depth. When laid within the limits of any public thoroughfare when the public sewer is sufficiently deep, no building sewer shall be less than six (6) feet (1.8 m) below grade. Whenever practicable, the alignment and grade of each building sewer shall be straight from the public sewer to the property line.

728.3 Taps and Saddles. Whenever it becomes necessary to connect a building sewer to a public sewer at a point where no branch fitting has been installed in the public sewer, such connection shall be made as required by Title 20 – Utilities – of the Los Angeles County Code, Division 2 – Sanitary Sewer and Industrial Waste Ordinance.

728.4 Connection to Trunks. Whenever required, an approved-type unvented running trap shall be installed in each building sewer which is connected directly to a trunk sewer by any means whatsoever. Each such running trap shall be installed in the building sewer between the house drain or drains and the connection to the trunk sewer. A T-type cleanout shall be installed in the building sewer immediately below the running trap. This cleanout need not be extended to grade. Every running trap and cleanout shall be located on the lot served by the building sewer.

728.5 Street Widening. Where a future street or road-widening area has been established by the master plan of highways or in any other manner, all

work installed in such area shall conform to the requirements established in this or other related ordinances for work on public property.

728.6 Main Line Required. Building sewer construction shall conform to the requirements of main line sewers as set forth in Title 20 – Utilities – of the Los Angeles County Code, Division 2 – Sanitary Sewer and Industrial Waste Ordinance, when either of the following conditions exists:

1. Where the Authority Having Jurisdiction requires such construction because of the character or quantity of the sewage or industrial waste to be discharged.
2. Where the sewer is designed to be, or proposed to be, dedicated to the County of Los Angeles at the present or any future time.

SECTION 8. Table H 101.8 of Appendix H is hereby amended to read as follows:

TABLE H 101.8
LOCATION OF SEWAGE DISPOSAL SYSTEM

MINIMUM HORIZONTAL DISTANCE IN CLEAR REQUIRED FROM	BUILDING SEWER	SEPTIC TANK	DISPOSAL FIELD	SEEPAGE PIT OR CESSPOOL
Building or structures ¹	2 feet	5 feet	8 feet	8 feet
Property line adjoining private	Clear ²	5 feet	5 feet	8 feet
Water supply wells ⁹	50 feet ³	50 feet	100 feet	150 feet
Streams and other bodies of water ⁹	50 feet	50 feet	100 feet ⁷	150 feet ⁷
Trees ¹⁰		10 feet		10 feet
Seepage pits or cesspools ⁸		5 feet	5 feet	12 feet
Disposal field ⁸		5 feet	4 feet ⁴	5 feet
On-site domestic water service line	1 foot ⁵	5 feet	5 feet	5 feet
Distribution box			5 feet	5 feet
Pressure public water main	10 feet ⁶	10 feet	10 feet	10 feet

For SI units: 1 foot = 304.8 mm

Notes:

1 Including porches and steps, whether covered or uncovered, breezeways, roofed porte cocheres, roofed patios,

- carports, covered walks, covered driveways, and similar structures or appurtenances.
- 2 See Section 312.3.
- 3 Drainage piping shall clear domestic water supply wells by not less than 50 feet (15 240 mm). This distance shall be permitted to be reduced to not less than 25 feet (7620 mm) where the drainage piping is constructed of materials approved for use within a building.
- 4 Plus 2 feet (610 mm) for each additional 1 foot (305 mm) of depth in excess of 1 foot (305 mm) below the bottom of the drain line. (See Section H 6.0)
- 5 See Section 720.0.
- 6 For parallel construction -- For crossings, approval by the Health Department shall be required.
- 7 These minimum clear horizontal distances shall also apply between disposal fields, seepage pits, and the mean high-tide line.
- 8 Where disposal fields, seepage pits, or both are installed in sloping ground, the minimum horizontal distance between any part of the leaching system and ground surface shall be 15 feet (4572 mm).
- 9 Where special hazards are involved, the distance required shall be increased as may be directed by the Authority Having Jurisdiction.
- 10 The septic tank and seepage pit shall not be within the protected zone of an oak tree as defined by Section 22.56.2060 of Title 22 – Planning and Zoning – of the Los Angeles County Code.

SECTION 9. Table H 201.1(1) of Appendix H is hereby amended to read as follows:

TABLE H 201.1(1)
CAPACITY OF SEPTIC TANKS^{1, 2, 3, 4, 5}

SINGLE-FAMILY DWELLINGS - NUMBER OF BEDROOMS	MULTIPLE DWELLING UNITS OR APARTMENTS - ONE BEDROOM EACH	OTHER USES: MAXIMUM FIXTURE UNITS SERVED PER TABLE 702.1	MINIMUM SEPTIC TANK CAPACITY (gallons)
1 or 2	—	15	750
3	—	20	1000
4	2 units	25	1200
5 or 6	3	33	1500
—	4	45	2000
—	5	55	2250
—	6	60	2500
—	7	70	2750
—	8	80	3000
—	9	90	3250
—	10	100	3500

For SI units: 1 gallon = 3.785 L

Notes:

- Extra bedroom, 150 gallons (568 L) each.
- Extra dwelling units over 10: 250 gallons (946 L) each.
- Extra fixture units over 100, 25 gallons (94.6 L) per fixture unit.
- Septic tank sizes in this table include sludge storage capacity and the connection of domestic food waste disposal units without further volume increase.
- Applies to mobile homes not installed in a mobile home park.

SECTION 10. Table H 201.1(2) of Appendix H is hereby amended to read as follows:

TABLE H 201.1(2)

ESTIMATED WASTE SEWAGE FLOW RATES^{1, 2-3}

TYPE OF OCCUPANCY	GALLONS PER DAY
1. Airports.....	15 per employee 5 per passenger
2. Auto washers	Check with equipment manufacturer
3. Bowling alleys (snack bar only).....	75 per lane
4. Camps:	
Campground with central comfort station	35 per person
Campground with flush toilets, no showers.....	25 per person
Day camps (no meals served)	15 per person
Summer and seasonal.....	50 per person
5. Churches (Sanctuary).....	5 per seat
with kitchen waste	7 per seat
6. Dance halls	5 per person
7. Factories	
no showers.....	25 per employee
with showers	35 per employee
Cafeteria, add	5 per employee
8. Hospitals.....	250 per bed
kitchen waste only.....	25 per bed
laundry waste only	40 per bed
9. Hotels (no kitchen waste).....	60 per bed (2 person)
10. Institutions (Resident)	75 per person
Nursing home.....	125 per person
Rest home.....	125 per person
11. Laundries, self-service	
(minimum 10 hours per day).....	50 per wash cycle <u>300 per machine</u>
Commercial	Per manufacturer's specifications
12. Motel	50 per bed space
with kitchen.....	60 per bed space
13. Offices	20 per employee
14. Parks, mobile homes	250 per space
Picnic parks (toilets only).....	20 per parking space
Recreational vehicles	
without water hook-up.....	75 per space
with water and sewer hook-up.....	100 per space
15. Restaurants – cafeterias	20 per employee <u>50 per seat</u>
toilet	7 per customer
kitchen waste.....	6 per meal
add for garbage disposal	1 per meal
add for cocktail lounge	2 per customer
kitchen waste – disposable service	2 per meal
16. Schools – Staff and office	20 per person
Elementary students	15 per person
Intermediate and high.....	20 per student
with gym and showers, add	5 per student
with cafeteria, add.....	3 per student
Boarding, total waste	100 per person
17. Service station, toilets	1000 for 1st bay 500 for each additional bay
18. Stores	20 per employee
Public restrooms, add	1 per 10 square feet of floor space
19. Swimming pools, public	10 per person
20. Theaters, auditoriums.....	5 per seat
Drive-in.....	10 per space

For SI units: 1 square foot = 0.0929 m², 1 gallon per day 3.785 L/day

Notes:

+Sewage disposal systems sized using the estimated waste/sewage flow rates shall be calculated as follows:

(a) —Waste/sewage flow, up to 1500 gallons per day (5678 L/day)

- Flow x 1.5 = septic tank size
 (b) Waste/sewage flow, over 1500 gallons per day (5678 L/day)
 Flow x 0.75 + 1125 = septic tank size
 (c) Secondary system shall be sized for total flow per 24 hours.

²¹See Section H 2.1.

²²Because of the many variables encountered, it is not possible to set absolute values for waste/sewage flow rates for all situations. The designer should evaluate each situation and, where figures in this table need modification, they should be made with the concurrence of the Authority Having Jurisdiction.

SECTION 11. Table H 201.1(3) of Appendix H is hereby amended to read as follows:

TABLE H 201.1(3)
DESIGN CRITERIA OF FIVE SIX TYPICAL SOILS

TYPE OF SOIL	REQUIRED SQUARE FEET OF LEACHING AREA PER 100 GALLONS	MAXIMUM ABSORPTION CAPACITY IN GALLONS PER SQUARE FEET OF LEACHING AREA FOR A 24 HOUR PERIOD
Coarse sand or gravel	20	5.0
Fine sand	25	4.0
Sandy loam or sandy clay	40	2.5
<u>Sandy clay</u>	<u>60</u>	<u>1.66</u>
Clay with considerable sand or gravel	90	1.1
Clay with small amount of sand or gravel	120	0.8

For SI units: 1 square foot = 0.0929 m², 1 gallon = 3.785 L, 1 gallon per square foot = 40.7 L/m²

SECTION 12. Table H 201.1(4) of Appendix H is hereby amended to read as follows:

TABLE H 201.1(4)
LEACHING AREA SIZE BASED ON SEPTIC TANK CAPACITY

REQUIRED SQUARE FEET OF LEACHING AREA PER 100 GALLONS SEPTIC TANK CAPACITY (square feet per 100 gallons)	MAXIMUM SEPTIC TANK SIZE ALLOWABLE (gallons)
20-25	7500
40	5000
<u>60</u>	<u>3500</u>
90	3500 <u>3000</u>
120	3000 <u>2500</u>

For SI units: 1 square foot per 100 gallons = 0.000245 m²/L, 1 gallon = 3.785 L

SECTION 13. Section H 301.1 is hereby amended to read as follows:

H 301.1 General.

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(3) No excavation for a leach line or leach bed shall be located within 5 feet (1,524 mm) of the groundwater table nor to a depth where sewage is capable of contaminating may contaminate the underground water stratum that is useable for domestic purposes.

EXCEPTION: ~~In areas where the records or data indicate that the ground waters are grossly degraded, the 5 foot (1524 mm) separation requirement shall be permitted to be reduced by the Authority Having Jurisdiction.~~ When approved by the Authority Having Jurisdiction, this distance may be reduced to 5 feet (1.5 m) from ocean water. The applicant shall supply evidence of groundwater depth to the satisfaction of the Authority Having Jurisdiction.

(4) The minimum effective absorption area in any seepage pit shall be calculated as the excavated sidewall area below the inlet exclusive of any hardpan, rock, clay, or other impervious formations. The minimum required area of porous formation shall be provided in one or more seepage pits. No excavation shall extend within 10 feet (3048 mm) of the groundwater table nor to a depth where sewage is capable of contaminating may contaminate underground water stratum that is useable for domestic purposes.

EXCEPTION: ~~In areas where the records or data indicate that the groundwaters are grossly degraded, the 10 foot (3048 mm) separation requirement shall be permitted~~

~~to be reduced by the Authority Having Jurisdiction.~~ When approved by the Authority Having Jurisdiction, this distance may be reduced to 5 feet (1.5 m) from ocean water.

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SECTION 14. Section H 401.3 is hereby amended to read as follows:

H 401.3 Absorption Rates. Where a percolation test is required, the proposed system shall have the capability to absorb a quantity of clear water in a 24-hour period equal to at least five times the liquid capacity of the proposed septic tank. ~~n~~No private disposal system shall be permitted to serve a building if that test shows the absorption capacity of the soil is less than 0.83 gallons per square foot (gal/ft²) (33.8 L/m²) or more than 5.12 gal/ft² (208.6 L/m²) of leaching area per 24 hours. Where the percolation test shows an absorption rate greater than 5.12 gal/ft² (208.6 L/m²) per 24 hours, a private disposal system may be permitted where the site does not overlies groundwaters protected for drinking water supplies, a minimum thickness of 2 feet (610 mm) of the native soil below the entire proposed system is replaced by loamy sand, and the system design is based on percolation tests made in the loamy sand.

SECTION 15. Section H 601.5 is hereby amended to read as follows:

H 601.5 Distribution Boxes. Where two or more drain lines are installed, an approved distribution box of sufficient size to receive lateral lines shall be installed at the head of each disposal field. The inverts of outlets shall be level, and the invert of the inlet shall be not less than 1 inch (25.4 mm) above the outlets. Distribution boxes shall be designed to ensure equal flow and shall be installed on a level concrete slab in natural or compacted soil. Distribution boxes shall be coated on the inside with a

bituminous coating or other approved method acceptable to the Authority Having Jurisdiction.

SECTION 16. Section H 601.8 is hereby amended to read as follows:

H 601.8 Dosing Tanks. ~~Where the quantity of sewage exceeds the amount that is permitted to be disposed in 500 lineal feet (152.4 m) of leach line, a dosing tank shall be used. Dosing tanks shall be equipped with an automatic siphon or pump that discharges the tank once every 3 or 4 hours. The tank shall have a capacity equal to 60 to 75 percent of the interior capacity of the pipe to be dosed at one time. Where the total length of pipe exceeds 1000 lineal feet (304.8 m), the dosing tank shall be provided with two siphons or pumps dosing alternately and each serving one-half of the leach field.~~ Automatic syphon or dosing tanks shall be installed when required or as permitted by the Authority Having Jurisdiction.

SECTION 17. Section H 701.2 is hereby amended to read as follows:

H 701.2 Multiple Installations. Multiple seepage pit installations shall be served through an approved distribution box or be connected in series ~~by means of a watertight connection laid on undisturbed or compacted soil. The outlet from the pit shall have.~~ When connected in series, the effluent shall leave each pit through an approved vented leg fitting extending not less than 12 inches (305 mm) below the inlet fitting downward into such existing pit and having its outlet flow line at least 6 inches below the inlet. All pipe between pits shall be laid with approved watertight joints.

SECTION 18. Section H 1001.1 is hereby amended to read as follows:

H 1001.1 **Inspection.** Inspection requirements shall comply with the following:

(1) Applicable provisions of Section ~~405~~104.0 of this eCode and this aAppendix shall be required. Plans shall be required in accordance with Section ~~403-3~~102.1 of this eCode.

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(5) Disposal fields and seepage pits shall not be installed in uncompacted fill.

SECTION 19. Section H 1101.6 is hereby added to read as follows:

H 1101.6 **Excavation.** No excavation for an abandoned sewer or sewage facility shall be left unattended at any time unless the permittee shall have first provided a suitable and adequate barricade to assure public safety.

SECTION 20. Appendix S is hereby amended to read as follows:

APPENDIX S

SOLAR THERMAL ENERGY SYSTEMS

S-1 General.

In addition to the requirements of this Appendix, the provisions of this Code and Title 29 – Mechanical Code – of the Los Angeles County Code shall apply to the erection, installation, alteration, relocation, replacement, addition to, use, maintenance, and repair of solar thermal energy systems, including but not limited to equipment and appliances intended to utilize solar thermal energy for water heating and swimming pool heating.

S-2 Definitions.

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Aperture. The maximum projected area of a solar collector through which the unconcentrated solar radiant energy is admitted.

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Collector Cover (Glazing). The material covering the aperture to provide thermal and environmental protection.

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Concentrating Solar Collector. A solar collector that uses reflectors, lenses, or other optical elements to concentrate the radiant energy passing through the aperture onto an absorber of which the surface area is smaller than the aperture area.

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Draindown (Drainback). An active solar energy system in which the fluid in the solar collector is drained from the solar energy system under prescribed circumstances.

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Fail-Safe Freeze Protection. A freeze-protection method that does not rely on the activation or continued operation of any mechanical or electrical component.

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Freeze Protection. Any method for protecting solar thermal systems from damage due to freezing conditions where installed in locations where freezing ambient temperature conditions exist.

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Integral Collector Storage. A solar thermal energy system that uses a solar collector that has all or most of its heat transfer medium inside the collector.

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Solar Thermal Energy System. See Solar Thermal System.

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Thermal Storage. A tank or vessel used in a solar thermal, hydronic, or geothermal system, in which thermal energy is stored.

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S-3 Permits Required.

It shall be unlawful for a person, firm, or corporation to construct, install, alter, repair, replace, or remodel a solar thermal energy system regulated by this Code or cause the same to be done without first obtaining a separate permit for each separate system or interconnected set of systems as specified in Section 103.0 of this Code.

S-4 Plans and Specifications.

Plans, engineering calculations, diagrams, and other data shall be submitted in one or more sets with each application for a permit. Where required by the Authority Having Jurisdiction, the plans, computations, diagrams, specifications and other data shall be prepared by, and the solar thermal energy system designed by, an engineer, an architect, or both, who shall be licensed by the state to practice as such.

EXCEPTION: The submission of plans, calculations or other data may be waived where the Authority Having Jurisdiction determines that the nature of the work

applied for is such that reviewing of plans is not necessary to obtain compliance within the Code.

S-5 Installation.

S-5.1 Listed Appliances. Except as otherwise provided in this Code, the installation of appliances regulated by this Code shall be in accordance with the conditions of the listing. The appliance installer shall leave the manufacturer's installation and operating instructions attached to the appliance. Clearances of listed appliances from combustible materials shall be as specified in the listing or on the rating plate.

S-5.2 Standards. Standards listed or referred to in this Appendix or other provisions of this Code cover materials that will conform to the requirements of this Code, where used in accordance with the limitations prescribed in this Code and their listing. Where a standard covers materials of various grades, weights, quality, or configurations, the portion of the listed standard that is applicable shall be used. Design and materials for special conditions or materials not provided for herein may be permitted as authorized by Section 301.3. A list of accepted material standards is referenced in Table S-17.

S-56 Inspection and Testing.

S-56.1 General. Solar thermal energy systems for which a permit is required by this Code shall be inspected by the Authority Having Jurisdiction. No solar thermal energy system or portion thereof shall be covered, concealed, or put into use until it first has been tested, inspected, and approved as prescribed in this Code.

Neither the Authority Having Jurisdiction nor the jurisdiction shall be liable for any expense entailed in the removal or replacement of material required to permit inspection. Solar thermal energy systems regulated by this Code shall not be connected to the water, the energy fuel supply, or the sewer system until authorized by the Authority Having Jurisdiction. Installation of a solar thermal energy system shall comply with ~~other parts of~~ this Code including ~~s~~Section 104.0.

S-56.2 Required Inspection. New solar thermal energy system work and such portions of existing systems as affected by new work, or changes, shall be inspected by the Authority Having Jurisdiction to ensure compliance with the requirements of this Code and to ensure that the installation and construction of the solar thermal energy system is in accordance with approved plans. The Authority Having Jurisdiction shall make the following inspections and other such inspections as necessary. The permittee or the permittee's authorized agent shall be responsible for the scheduling of such inspections as follows:

. . .

S-56.3 Testing. Solar thermal energy systems shall be tested and approved as required by this Code or the Authority Having Jurisdiction.

S-56.3.1 Piping. The piping of the solar thermal system shall be tested with water, air, a heat transfer liquid medium, or as recommended by the manufacturer's instructions, except that plastic pipe shall not be tested with air. The Authority Having Jurisdiction shall be permitted to require the removal of plugs, etc., to ascertain where the pressure has reached all parts of the system. ~~In cases where it~~

~~would be impractical to provide the required water or air tests, or for minor installations and repairs, the Authority Having Jurisdiction shall be permitted to make such inspection as deemed advisable in order to be assured that the work has been performed in accordance with the intent of this Code. Joints and connections in the solar energy system shall be gastight and watertight for the pressures required by the test.~~

S-56.3.2 System Requirements. ~~Upon completion, the~~Prior to the installation of insulation and startup, a solar thermal system, including piping, collectors, heat exchangers, and other related equipment, shall be tested and proved airtight.

S-5.3.2.1 ~~Open Loop Systems.~~ Open loop systems directly connected to the potable water system shall be tested under a water pressure not less than the maximum working pressure under which it is to be used. The water used for tests shall be obtained from a potable source of supply. A 50 pound force per square inch (psi) (345 kPa) air pressure test shall be permitted to be substituted for the water test.

S-5.3.2.2 ~~Other Open Loop Systems.~~ Systems operating at atmospheric pressure shall be tested under actual operating conditions.

S-5.3.2.3 ~~Closed Loop Systems.~~ Closed loop or other type pressure systems shall be tested at one and one-half times maximum designed operating pressure. Systems shall withstand the test without leaking for a period of not less than 15 minutes.

S-5.3.3 Storage Tanks. Storage tanks conforming to the

requirements of Section S-8 shall be tested in accordance with Sections S-5.3.3.1 and S-5.3.3.2.

S-5.3.3.1 Pressure Type. The test pressure for storage tanks that are subject to water pressure from utility mains (with or without a pressure reducing valve) shall be two times the working pressure but not less than 300 psi (2068 kPa).

S-5.3.3.2 Non-Pressure Type. A storage tank shall be tested by filling it with water for a period of 24 hours prior to inspection and shall withstand the test without leaking. No tank or portion thereof shall be covered or concealed prior to approval.

S-6.3.2.1 Direct (Open Loop) Systems. Direct (open loop) systems shall be tested under a water pressure not less than one and one-half times the maximum design operating pressure of 150 pounds force per square inch (psi) (1034 kPa), whichever is more. Systems shall withstand the test without leaking for a period of not less than 15 minutes.

S-6.3.2.2 Indirect (Closed Loop) Systems. Indirect (closed loop) systems shall be hydrostatically tested at one and one-half times the maximum designed operating pressure in accordance with the manufacturer's installation instructions. Systems shall withstand the test without leaking for a period of not less than 15 minutes.

S-6.3.3 Test Pressure for Storage Tanks. The test pressure for storage tanks that are subject to water pressure from utility mains (with or without a

pressure reducing valve) shall be two times the working pressure but not less than 300 psi (2068 kPa).

S-6.3.3.1 Pressure Type. Pressure-type storage tanks exceeding 15 psi (103 kPa) shall be tested in accordance with ASME BPVC Section VIII. Pressure-type storage tanks not exceeding 15 psi (103 kPa) shall be hydrostatically tested at one and one-half times the maximum design operating pressure.

S-6.3.3.2 Atmospheric-Type. Atmospheric-type thermal storage tanks shall be tested by filling with water for a period of 24 hours prior to inspection and shall withstand the test without leaking. No thermal storage tank or portion thereof shall be covered or concealed prior to approval.

S-56.3.4 Connection to Service Utilities. No person shall make connections from a source of energy or fuel to a solar thermal energy system or equipment regulated by this Code and for which a permit is required until approved by the Authority Having Jurisdiction. No person shall make connection from a water-supply line nor shall any person connect to a sewer system regulated by this Code and for which a permit is required until approved by the Authority Having Jurisdiction. The Authority Having Jurisdiction shall be permitted to authorize temporary connection of the solar thermal energy system equipment to the source of energy or fuel for the purpose of testing the equipment.

S-6 ~~Location.~~

S-6.1 ~~System. Except as otherwise provided in this Code, no solar energy system, or parts thereof shall be located in a lot other than the lot that is~~

~~the site of the building, structure, or premises served by such facilities.~~

~~**S-6.2** **Ownership.** No subdivision, sale, or transfer of ownership of existing property shall be made in such manner that the area, clearance, and access requirements of this Code are decreased.~~

~~...~~

~~**S-8** **Tanks.**~~

~~**S-8.1** **Storage Tanks.**~~

~~...~~

~~**S-8.1.2** **Gravity Storage Tanks.** Gravity storage tanks shall be installed with an overflow opening of not less than 2 inches (50 mm) Internal Pipe Size (IPS). The openings shall be aboveground and installed with a screened return bend.~~

~~**S-8.1.2** **Atmospheric Tanks.** Atmospheric storage tanks shall be vented to the atmosphere and installed in accordance with the manufacturer's installation instructions.~~

~~**S-8.1.2.1** **Overflow.** Gravity tanks shall be installed with an overflow opening of not less than 2 inches (50 mm) in diameter. The openings shall be above ground and installed with a screened return bend.~~

~~**S-8.1.2.2** **Makeup Water.** Makeup water from a potable water system to an atmospheric tank shall be protected by an air gap.~~

~~**S-8.1.2.3** **Draining.** An overflow shall be provided for an atmospheric tank. The overflow shall be provided with a means of drainage in accordance with~~

Section 303.0 of this Code. The overflow for an atmospheric tank containing nonpotable water shall be emptied into an approved container.

S-8.1.3 Prefabricated Storage Tanks. Prefabricated storage tanks shall be listed by an approved agency and labeled.

~~**S-8.1.4 Pressure-Type Storage Tanks.** Pressure-type water storage tanks shall be installed with a listed combination temperature and pressure-relief valve. The temperature setting shall not exceed 210°F (99°C). The pressure setting shall not exceed 150 percent of the maximum designed operating pressure of the solar thermal system, or 150 percent of the established normal operating pressure of the piping materials, or the labeled maximum operating pressure of a pressure-type storage tank, whichever is less. The relief valve setting shall not exceed the recommendations of the equipment manufacturer.~~

~~All storage tanks, including bottom-fed storage tanks, connected to a water heater shall be provided with a vacuum-relief valve at the top of the tank that will operate up to a water pressure not exceeding 200 psi (1379 kPa) and up to a temperature not exceeding 250°F (121°C) to prevent siphoning of any water heater or storage tank. The size of such vacuum-relief valves shall have a minimum rated capacity for the equipment served. This Section shall not apply to pressurized captive air diaphragm/bladder storage tanks.~~

~~Valves shall not be located on either side of a relief valve connection. The relief valve discharge pipe shall be of approved material that is rated for the temperature of the solar thermal system. The discharge pipe shall be the same diameter as the relief~~

~~valve outlet, and shall discharge by gravity through an air gap into the drainage system or outside of the building with the end of the pipe not exceeding 2 feet (610 mm) nor less than 6 inches (152 mm) above the ground and pointing downward.~~

S-8.1.4 **Pressure Vessels.** A pressure-type storage tank exceeding an operating pressure of 15 psi (103kPa) shall be constructed in accordance with ASME BPVC Section VIII. Fiber-reinforced plastic storage tanks shall be constructed in accordance with ASME BPVC Section X.

S-8.1.5 **Devices.** Devices attached to or within a tank shall be accessible for repair and replacement.

S-8.1.5.1 **Safety Devices.** Pressure-type thermal storage tanks shall be installed with a listed combination temperature and pressure relief valve in accordance with Section S-13.3.1. The temperature setting shall not exceed 210°F (99°C) and the pressure setting shall not exceed 150 percent of the maximum designed operating pressure of the system, or 150 percent of the established normal operating pressure of the piping materials, or the labeled maximum operating pressure of a pressure-type storage tank, whichever is less. The pressure and temperature setting shall not exceed the pressure and temperature rating of the tank or as recommended by the tank manufacturer.

Storage tanks and bottom-fed tanks connected to a water heater shall be designed to withstand vacuum induced pressure, or shall be provided with a vacuum relief in accordance with Section S-13.3.4. The vacuum relief valve shall be installed at the top of the tank and shall have an operating pressure not to exceed 200 psi

(1379 kPa) and a temperature rating not to exceed 250°F (121°C). The size of such vacuum relief valves shall have a minimum rated capacity for the equipment served. This Section shall not apply to pressurized captive air diaphragm or bladder tanks.

S-8.1.56 Separate Storage Tanks. For installations with separate storage tanks, a pressure relief valve and temperature relief valve or combination thereof shall be installed on both the water heater and storage tank main storage and auxiliary tank. ~~There shall not be a check valve or shutoff valve between a relief valve and the heater or tank served.~~

~~The relief valve discharge pipe shall be of approved material that is rated for the temperature of the solar thermal system. The discharge pipe shall be the same diameter as the relief valve outlet, discharge by gravity through an air gap into the drainage system or outside of the building with the end of the pipe not exceeding 2 feet (610 mm) nor less than 6 inches (152 mm) above the ground and pointing downward. Discharges from such valves on solar thermal systems utilizing other than potable water heat transfer mediums shall be approved by the Authority Having Jurisdiction.~~

S-8.1.6.1 Isolation Valves. Storage tanks shall be provided with isolation valves for servicing.

S-8.1.67 Underground Storage Tanks. ~~Storage t~~Tanks shall be permitted to be buried underground where designed and constructed for such installation.

S-8.1.7 Pressure Vessels. ~~Pressure vessels, and the installation thereof, shall comply with minimum requirements for safety from structural failure,~~

mechanical failure, and excessive pressures in accordance with the requirements of the Authority Having Jurisdiction and nationally recognized standards.

S-8.1.8 ~~Devices.~~ Devices attached to or within a storage tank shall be accessible for repair and replacement.

S-8.1.98 **Storage Tank Covers.** Storage tank covers shall be structurally designed to withstand anticipated loads and pressures in accordance with the manufacturer's instructions.

S-8.1.10 ~~Watertight Pan.~~ Where a storage tank is installed in an attic, attic-ceiling assembly, floor-ceiling assembly, or floor-subfloor assembly where damage could result from a leaking storage tank, a watertight pan of corrosion-resistant materials shall be installed beneath the storage tank with not less than 3/4 of an inch (20 mm) diameter drain to a location satisfactory to the Authority Having Jurisdiction.

S-8.1.9 **Drainage Pan.** Where a water heater, boiler, or thermal storage tank is located in an attic, or in or on an attic-ceiling assembly, floor-ceiling assembly, or floor-subfloor assembly where damage may result from a leaking water heater, boiler, or tank, a watertight pan of corrosion-resistant materials shall be installed beneath the water heater, boiler, or tank, with not less than 3/4 of an inch (20 mm) diameter drain to an approved location. Such pan shall be not less than 1 1/2 inches (38 mm) in depth.

S-8.1.110 **Storage Tank Construction and Materials.**

S-8.1.11.1 ~~Construction.~~ Storage tanks shall be constructed of durable materials not subject to excessive corrosion or decay and shall be watertight.

~~Each such tank shall be structurally designed to withstand anticipated loads and pressures and shall be installed level and on a solid bed.~~

~~**S-8.1.11.2** ——— **Standards.** Storage tanks shall be constructed in accordance with recognized standards referenced in this Code and approved by the Authority Having Jurisdiction.~~

~~**S-8.1.11.3** ——— **Concrete.** The walls and floor of each poured-in-place, concrete storage tank shall be monolithic. The exterior walls shall be double-formed so as to provide exposure of the exterior walls during the required water test. The compressive strength of a concrete tank wall, top and covers, or floor shall be not less than 2500 pounds per square inch (lb/in²) (1.7577 E+06 kg/m²). Where required by the Authority Having Jurisdiction, the concrete shall be sulfate resistant (Type V Portland Cement).~~

~~**S-8.1.11.4** ——— **Metal Storage Tanks.** Metal storage tanks shall be welded, riveted and caulked, brazed, bolted, or constructed using a combination of these methods. Filler metal used in brazing for a metal storage tank shall be non-ferrous metal or an alloy having a melting point above 1000°F (538°C) and below that of the metal joined.~~

~~**S-8.1.11.5** ——— **Non-Fiberglass Storage Tanks.** Non-fiberglass storage tanks shall be constructed in accordance with ASME Boiler and Pressure Vessel Code, Section VIII or other approved standards.~~

~~**S-8.1.11.6** ——— **Fiber-Reinforced Storage Tanks.** Fiber-reinforced storage tanks shall be constructed in accordance with ASME Boiler and Pressure Vessel Code,~~

Section X or other approved standards.

S-8.1.10.1 Construction. Storage tanks shall be constructed of durable materials not subject to excessive corrosion or decay and shall be watertight. Each such tank shall be structurally designed to withstand anticipated loads and pressures and shall be installed level and on a solid bed.

S-8.1.10.2 Concrete. The walls and floor of each poured-in-place, concrete tank shall be monolithic. The exterior walls shall be double-formed so as to provide exposure of the exterior walls during the required water test. The compressive strength of a concrete tank wall, top and covers, or floor shall be not less than 2500 psi (lb/in²) (1.7577 E+06 kg/m²). Where required by the Authority Having Jurisdiction, the concrete shall be sulfate resistant (Type V Portland Cement).

S-8.1.10.3 Metal Tanks. Metal tanks shall be welded, riveted and caulked, brazed, bolted, or constructed by use of a combination of these methods.

S-8.1.10.4 Filler Metal. Filler metal used in brazing shall be nonferrous metal or an alloy having a melting point above 1000°F (538°C) and below that of the metal joined.

S-8.2 Expansion Tanks.

S-8.2.1 Where Required. An expansion tank shall be installed in a solar thermal system ~~where a pressure reducing valve, backflow prevention device, check valve or other device is installed on a water supply system utilizing storage or tankless water heating equipment as a means for controlling increased pressure caused~~ by thermal expansion. Expansion tanks shall be of the closed or open type and

securely fastened to the structure. ~~Expansion tanks~~Tanks shall be rated for the pressure of the system. Supports shall be capable of carrying twice the weight of the ~~expansion tank~~ tank filled with water without placing strain on the connecting piping.

Solar thermal systems incorporating hot water tanks or fluid relief columns shall be installed to prevent freezing under normal operating conditions.

...

S-8.2.3 Closed-Type Solar Thermal Systems. Closed-type solar thermal systems shall have an airtight tank or other approved air cushion that will be consistent with the volume and capacity of the system, and shall be designed for a hydrostatic test pressure of two and one-half times the allowable working pressure of the system. Expansion tanks for systems designed to operate at or above 30 pounds-force per square inch (psi) (207 kPa) shall be constructed in accordance with nationally recognized standards and the Authority Having Jurisdiction comply with ASME BPVC Section VIII. Provisions shall be made for draining the tank without emptying the system, ~~except for pressurized tanks~~.

S-8.2.4 Minimum Capacity of Closed-Type Expansion Tank. The minimum capacity of a ~~closed-type~~gravity-type hot water system expansion tank shall be in accordance with Table S-8.2.4(1) ~~and~~. The minimum capacity for a forced-type hot water system expansion tank shall be in accordance with Table S-8.2.4(2) or ~~from the following formula:~~Equation S-8.2.4.

...

S-9 Solar Collectors.

S-9.1 ~~Construction.~~

S-9.1.1 **General.** Frames and braces exposed to the weather shall be constructed of materials for exterior locations, and protected from corrosion or deterioration, in accordance with the requirements of the Authority Having Jurisdiction.

S-9.1.21 **Construction.** Collectors shall be designed and constructed to prevent interior condensation, out-gassing, or other processes that will reduce the transmission properties of the glazing, reduce the efficiency of the insulation, or otherwise adversely affect the performance of the collector.

S-9.1.32 **Flat Plate Collector Glass.** Flat plate collector Gglass used ~~in collector construction~~ shall be tempered.

S-9.1.43 **Plastic.** Plastic used in collectors and other parts of the solar thermal system construction shall be installed in accordance with the manufacturer's installation instructions.

S-9.1.54 **Listing.** Collectors that are manufactured as a complete component shall be listed or labeled by an approved listing agency in accordance with SRCC 100, UL 1279, or equivalent standard.

S-9.1.65 **Air Collectors.** Materials exposed within air collectors shall be noncombustible or shall have a flame spread index not to exceed 25 and a smoke developed index not to exceed 50 where tested as a composite product in accordance with ASTM E 84 or UL 723.

S-9.1.65.1 **Testing.** Materials used within an air collector shall not smoke, smolder, glow, or flame where tested in accordance with ASTM C 411 at

temperatures exposed to in service. In no case shall the test temperature be less than 250°F (121°C).

S-9.2 Solar Collector Installation.

...

S-9.2.3 Above Or On The Roof. Collectors located above or on roofs, and functioning as building components, shall not reduce the required fire-resistance and fire-retardance classification of the roof covering materials.

Exceptions:

- (1) Collectors located on one- and two-family dwellings.
- (2) Collectors located on buildings not exceeding three stories in height or 9000 square feet (836.13 m²) total floor area, or both, provided:
 - (a) The collectors are noncombustible;
 - (b) Collectors with plastic covers have noncombustible sides and bottoms, and the total area covered and the collector shall not exceed the following:
 - i. Plastic CC1 – 33 1/3 percent of the roof area,
 - ii. Plastic CC2 – 25 percent of the roof area; and
 - (c) Collectors with plastic film covers having a thickness of not more than 0.010 of an inch (0.25 mm) shall have noncombustible sides and bottoms, and the total area covered by the collector shall not exceed 33 1/3 percent of the roof area.

S-9.2.34 Ground Installations. ~~Solar collectors installed at ground-level shall be not less than 6 inches (152 mm) above the ground level~~ shall terminate

above finished grade to avoid obstruction by vegetation, snow, or ice. The supporting columns shall extend below the frost line.

S-9.2.5 **Wall Mounted.** Solar collectors mounted on a wall shall be secured and fastened in accordance with Section 313.0 of this Code.

S-9.2.46 **Access.** Access shall be provided to collectors and components in an approved manner. A work space adjacent to collectors for maintenance and repair shall be provided in accordance with requirements of the Authority Having Jurisdiction.

S-9.2.57 **Stagnation Condition.** The collector and other parts of the solar thermal assembly shall be capable of withstanding stagnant conditions in accordance with the manufacturer's instructions where high solar flux and no flow occurs.

S-9.2.68 **Waterproofing.** Joints between structural supports and buildings or dwellings, including penetrations made by bolts or other means of fastening, shall be made watertight with approved material.

S-9.2.79 **Fasteners.** Mountings and fasteners shall be made of corrosion-resistant materials. Carbon steel mountings and fasteners shall be classified as noncorrosive in accordance with ASME SA194.

S-9.2.810 **Combustible Materials.** ~~Collectors~~Solar thermal systems constructed ~~of~~with combustible materials shall not be located on or adjacent to construction required to be of noncombustible materials or in Very High Fire Hazard

Severity Zone (~~VHF~~HSZ) as defined in Title 32 – Fire Code of the Los Angeles County Code, unless approved by the Authority Having Jurisdiction.

S-9.2.911 Orientation. Collectors shall be located and oriented in accordance with the manufacturer's installation instructions.

~~**S-9.2.10 Wall Mounted.** Solar collectors that are mounted on a wall shall be secured and fastened in an approved manner in accordance with Section 313.0 of this Code.~~

S-9.3 Fire Safety Requirements.

~~...~~

~~**S-9.3.2 Above or On the Roof.** Collectors located above or on roofs, and functioning as building components, shall not reduce the required fire-resistance and fire-retardance classification of the roof covering materials.~~

EXCEPTIONS:

~~(1) Collectors located on buildings not exceeding three stories in height, a 9000 square feet (836.13 m²) total floor area; or both providing:~~

~~(a) The collectors are noncombustible.~~

~~(b) Collectors with plastic covers have noncombustible sides and bottoms, and the total area covered and the collector shall not exceed the following:~~

~~(i) Plastic CC1 — 33¹/₃ percent of the roof area.~~

~~(ii) Plastic CC2 — 25 percent of the roof area.~~

~~(c) — Collectors with plastic film covers having a thickness of not more than 0.010 of an inch (0.254 mm) shall have noncombustible sides and bottoms, and the total area covered by the collector shall not exceed 33¹/₃ percent of the roof area.~~

S-10 Hazardous Heat Transfer Medium for Solar Thermal Systems.

~~S-10.1 — Approval.~~ Heat-transfer mediums that are hazardous shall not be used in solar thermal systems, except ~~with prior approval of~~ where approved by the Authority Having Jurisdiction.

S-10.21 Flash Points. The flash point of a heat-transfer medium shall be:

~~(1) — Not less than 50°F (10°C) or more above the design maximum temperature, nonoperating temperature and as high as the maximum stagnation temperature of the medium in the solar thermal system.~~

~~(2) — Not less than 50°F (10°C) above the design maximum operating temperature and exceeding the maximum stagnation temperature minus 200°F (93°C) of the medium in the solar thermal system.~~

S-10.32 Discharge. The collector, collector manifold, and manifold relief valve shall not discharge directly or indirectly into the building or toward an open flame or other source of ignition.

S-11 Heat Exchangers.

S-11.1 General. ~~Heat exchangers used for heat transfer, heat recovery, or Solar thermal systems shall protect the potable water system from being~~

~~contaminated by the heat transfer medium. Single-wall heat exchangers shall meet the requirements of Section S-11.2. Double-wall heat exchangers shall separate the potable water from the heat transfer medium by providing a space between the two walls that is vented to the atmosphere.~~

S-11.2 ~~Single-Wall Heat Exchangers.~~ Solar thermal systems utilizing heat exchangers shall protect the potable water system from being contaminated by the heat transfer medium. Systems that incorporate a single-wall heat exchanger to separate potable water from the heat-transfer fluid shall meet all of the following requirements:

(1) The heat transfer medium is either potable water or contains fluids recognized as safe by the Food and Drug Administration (FDA) as food grade.

(2) ~~Bears a~~A tag or label shall be securely affixed to the heat source with the word ~~"Caution," followed by~~"CAUTION" and the following statements:

(a) The heat transfer medium ~~must~~shall be water or other nontoxic fluid recognized as safe by the FDA.

(b) The maximum operating pressure of the heat exchanger ~~is not permitted to~~shall not exceed the maximum operating pressure of the potable water supply.

(3) The word ~~"Caution,"~~"CAUTION" and the statements ~~in letters~~listed above shall have an uppercase height of not less than 0.120 of an inch (3.048 mm). The

vertical spacing between lines of type shall be not less than 0.046 of an inch (1.168 mm). Lowercase letters shall be not less than compatible with the uppercase letter size specification.

Systems that do not comply with the requirements for a single-wall heat exchanger shall install a double-wall heat exchanger. Double-wall heat exchangers shall separate the potable water from the heat transfer medium by providing a space between the two walls vented to the atmosphere.

S-12 Valves.

S-12.1 General. Valves shall be rated for the operating temperature and pressures of the solar thermal system and shall be compatible with the type of heat transfer medium and piping materials. Valves shall be installed in accordance with this Section. ~~Valves shall be approved for the installation with the piping materials to be installed.~~

~~**S-12.2 Fullway Valves.** A fullway valve shall be installed on the water supply to solar thermal systems and on the water supply pipe to a gravity or pressurized water tank or to a water heater.~~

~~**S-12.3 Shutoff Valves.** A shutoff valve shall be installed on the supply line to each appliance, equipment, or pressure vessel and on a nondiaphragm-type expansion tank.~~

~~**S-12.4 Balancing Valves.** Balancing valves shall be permitted to be used to obtain uniform flow distribution. Balancing valves shall be installed at the outlet of each group of collectors. Balancing valves shall be made of a bronze body~~

~~with a brass ball, plastic, or other types compatible with the heat transfer medium. Final settings shall be marked on each balancing valve in an approved manner.~~

~~**S-12.5** **Accessible.** Required fullway or shutoff valves shall be accessible.~~

~~**S-12.6** **Control Valves.** An approved three-way valve shall be permitted to be installed for manual control of solar thermal systems. An approved electric control valve shall be permitted to be installed for automatic control of solar thermal systems. The installation and operation of automatic control valves shall comply with the manufacturer's instructions.~~

~~**S-12.7** **Check Valves.** An approved-type check valve shall be installed on liquid heat transfer piping where the solar energy system design is capable of allowing reverse thermosiphoning of heated liquids into the collector array.~~

~~**S-12.8** **Automatic Air Vents.** Automatic air release vents shall be installed at high points of the solar thermal system in accordance with the system design requirements and manufacturer's installation instructions.~~

~~**S-12.9** **Closed Loop Systems.** Closed loop systems, where hose bibbs or similar valves are used to charge or drain the system, shall be of loose key-type; have valve outlets capped; or have handles removed where the system is operational.~~

~~**S-12.2** **Heat Exchanger.** Isolation valves shall be installed on the supply and return side of the heat exchanger.~~

S-12.3 **Pressure Vessels.** Isolation valves shall be installed on connections to pressure vessels.

S-12.4 **Pressure Reducing Valves.** Isolation valves shall be installed on both sides of a pressure reducing valve.

S-12.5 **Equipment, Components, and Appliances.** Serviceable equipment, components, and appliances within the system shall have isolation valves installed upstream and downstream of such devices.

S-12.6 **Expansion Tanks.** Isolation valves shall be installed at connections to non-diaphragm-type expansions tanks.

S-12.7 **Flow Balancing Valves.** Where flow balancing valves are installed, such valves shall be capable of increasing or decreasing the amount of flow by means of adjustment.

S-12.7.1 **Location.** Balancing valves shall be installed at the outlet of each group of collectors.

S-12.8 **Control Valves.** An approved three-way valve shall be permitted to be installed for manual control systems. An approved electric control valve shall be permitted to be installed for automatic control systems. The installation and operation of automatic control valves shall comply with the manufacturer's instructions.

S-12.8.1 **Mixing or Temperature Control Valves.** Where mixing or temperature control valves are installed, such valves shall be capable of obtaining the design water temperature and design flow requirements.

S-12.9 **Thermosiphoning.** An approved type check valve shall be installed on liquid heat transfer piping to control thermosiphoning of heated liquids.

S-12.10 **Air Removal Device or Air Vents.** Isolation valves shall be installed where air removal devices or automatic air vents are utilized to permit cleaning, inspection, or repair without shutting the system down.

S-12.11 **Closed Loop Systems.** Closed loop systems, where hose bibbs or similar valves are used to charge or drain the system, shall be of loose key type, have valve outlets capped, or have handles removed where the system is operational.

S-12.12 **Fullway Valves.** A fullway valve shall be installed in the following locations:

- (1) On the water supply to a solar thermal system;
- (2) On the water supply pipe to a gravity or pressurized water tank; and
- (3) On the water supply pipe to a water heater.

S-12.13 **Accessible.** Required fullway or shutoff valves shall be accessible.

S-13 **Piping and Cross-connection Control For Solar Thermal Systems.**

S-13.1 **Cross Connection Control.**

~~S-13.1.1~~ **~~Prohibited Installation.~~** ~~No piping installation of solar thermal piping, or part thereof, shall be made in such a manner that it will be possible for used, unclean, polluted, or contaminated water, mixtures, or substances to enter a~~

portion of the potable water system from a pipe, tank, receptor, or any other equipment by reason of backsiphonage, suction, or any other cause, either during normal use and operation thereof, or where such pipe, tank, receptor, or equipment is subject to pressure exceeding the operating pressure in the potable water system.

~~S-13.1.2~~ ————— ~~Cross-Contamination.~~ No person shall make a connection or allow one to exist between pipes or conduits carrying potable water supplied by a public or private building supply system, and pipes or conduits containing or carrying water from other source or containing or carrying water that has been used for any purpose whatsoever, or piping carrying chemicals, liquids, gases, or substances unless there is provided a backflow prevention device approved for the potential hazard and maintained in accordance with this Code.

~~S-13.1.3~~ ————— ~~Backflow Prevention.~~ No device or construction shall be installed or maintained, or shall be connected to a potable water supply, where such installation or connection provides a possibility of polluting such water supply or cross-connection between a distributing system of water for drinking and domestic purposes and water that becomes contaminated by such device or construction unless there is provided a backflow prevention device approved for the potential hazard. Backflow prevention devices shall comply with Sections 602 and 603 of this Code.

~~S-13.1.4~~ ————— ~~Water Supply Inlets.~~ Water supply inlets to tanks and other receptors shall be protected by one of the following means:

- ~~(1) — An approved air gap.~~
- ~~(2) — A listed vacuum breaker installed on the discharge side of the last valve.~~

with the critical level not less than 6 inches (152 mm) or in accordance with its listing.

(3) ~~— A backflow preventer suitable for the contamination or pollution, installed in accordance with the requirements for that type of device or assembly as set forth in this Code.~~

S-13.2 Materials.

S-13.2.1 Piping Materials. ~~Piping materials shall comply with the applicable standards referenced in Table 604.1 and other provisions of this Code. Materials shall be rated for the operating temperature and pressures of the solar energy system and shall be compatible with the type of heat transfer medium and shall be approved for such use. Pipe fittings and valves shall be approved for the piping systems, and shall be compatible with, or shall be of the same material as the pipe or tubing. Exterior piping shall be protected from corrosion, degradation, and shall be resistant to UV radiation. Galvanized steel shall not be used in solar thermal systems where in contact with glycol heat transfer fluid.~~ Piping, tubing and fittings materials shall comply with Table S-13.2. Joining methods shall be in accordance with Section 605.0. Materials in contact with the heat transfer medium shall be approved for such use. Galvanized steel shall not be used for solar thermal piping systems containing antifreeze. Black steel shall not be used in systems with entrained air. Unions between dissimilar metals shall comply with Sections 310.6 and 605.15. The material used shall be capable of withstanding the maximum temperature and pressure of the system.

S-13.2.1.1 Adhesives. Adhesives used in a solar collector shall not vaporize at the design temperature.

S-13.2.1.2 **Potable Water.** Materials in contact with potable water shall comply with NSF 61.

S-13.2.1.3 **Racks.** Dissimilar metals used for racking shall be isolated to prevent galvanic corrosion. Paint shall not be used as a method of isolation.

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S-13.2.3 **Storage Tank Connectors.** Flexible metallic storage tank connectors or reinforced flexible storage tank connectors connecting a storage tank to the piping system shall be in accordance with the applicable standards (ASME A112.18.6-2009/CSA B 125.6-2009 (R2014)). Copper or stainless steel flexible connectors shall not exceed 24 inches (610 mm). PEX, PE-AL-PE, or PE-RT tubing shall not be installed within the first 18 inches (457 mm) of piping connected to a storage tank.

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TABLE S-13.2

MATERIALS FOR SOLAR THERMAL SYSTEM, PIPING, TUBING, AND FITTINGS

<u>MATERIAL</u>	<u>PIPING/TUBING</u>	<u>FITTINGS</u>
<u>Copper/Copper Alloy</u>	<u>ASTM B42, ASTM B43, ASTM B75, ASTM B88, ASTM B135, ASTM B251², ASTM B302, ASTM B447</u>	<u>ASME B16.15, ASME B16.18, ASME B16.22, ASME B16.23, ASME B16.24, ASME B16.26, ASME B16.29, ASME B16.51</u>
<u>Ductile Iron</u>	<u>AWWA C115, AWWA C151</u>	<u>AWWA C110¹, AWWA C153</u>
<u>Steel</u>	<u>ASTM A53, ASTM A106, ASTM A254</u>	<u>ASME B16.5, ASME B16.9, ASME B16.11, ASTM A420</u>
<u>Gray Iron</u>	<u>—</u>	<u>ASTM A126</u>
<u>Malleable Iron</u>	<u>—</u>	<u>ASME B16.3</u>
<u>Acrylonitrile Butadiene Styrene (ABS)</u>	<u>ASTM D1527</u>	<u>—</u>

<u>Chlorinated Polyvinyl Chloride (CPVC)</u>	<u>ASTM D2846, ASTM F441, ASTM F442</u>	<u>ASTM D2846, ASTM F437, ASTM F438, ASTM F439, ASTM F1970</u>
<u>Polyethylene (PE)</u>	<u>ASTM D1693, ASTM D2513, ASTM D2683, ASTM D2837, ASTM D3035, ASTM D3350, ASTM F1055, CSA B137.1</u>	<u>ASTM D2609, ASTM D2683, ASTM D3261, ASTM F1055, CSA B137.1</u>
<u>Cross-Linked Polyethylene (PEX)</u>	<u>ASTM F876, ASTM F877, CSA B137.5</u>	<u>ASSE 1061, ASTM F877, ASTM F1807, ASTM F1960, ASTM F1961, ASTM F2080, ASTM F2159, ASTM F2735, CSA B137.5</u>
<u>Polypropylene (PP)</u>	<u>ASTM F2389</u>	<u>ASTM F2389</u>
<u>Polyvinyl Chloride (PVC)</u>	<u>ASTM D1785, ASTM D2241</u>	<u>ASTM D2464, ASTM D2466, ASTM D2467, ASTM F1970</u>
<u>Raised Temperature Polyethylene (PE-RT)</u>	<u>ASTM F2623, ASTM F2769</u>	<u>ASTM F1807, ASTM F2159, ASTM F2735, ASTM F2769</u>
<u>Cross-Linked Polyethylene/Aluminum/ Cross-Linked Polyethylene (PEX-AL-PEX)</u>	<u>ASTM F1281, ASTM F2262, CSA B137.10</u>	<u>ASTM F1281, ASTM F1974, ASTM F2434, CSA B137.10</u>
<u>Polyethylene/Aluminum/Polyethylene (PE-AL-PE)</u>	<u>ASTM F1282, CSA B137.9</u>	<u>ASTM F1282, ASTM F1974, CSA B137.9</u>
<u>Stainless Steel</u>	<u>ASTM A269, ASTM A312</u>	<u>—</u>

Notes:

¹ Ductile and gray iron.

² Only Type K, L, or M shall be permitted to be installed.

S-13.3 Safety Devices.

S-13.3.1 Pressure Relief Valves. Solar thermal energy system

components containing pressurized fluids shall be protected against pressures exceeding design limitations with a pressure relief valve. Each section of the system in which excessive pressures are capable of developing shall have a relief device located so that a section cannot be isolated from a relief device. Pressure and temperature relief valves shall be installed in accordance with the terms of their listing and the manufacturer's installation instructions. ~~Valves shall not be located on either side of a~~

~~relief valve connection. The relief valve discharge pipe shall be of approved material that is rated for the temperature of the system. The discharge pipe shall be the same diameter as the relief valve outlet and shall discharge by gravity through an air gap into the drainage system or outside of the building with the end of the pipe not exceeding 2 feet (610 mm) nor less than 6 inches (152 mm) above the ground and pointing downward.~~

S-13.3.2 Vacuum Relief Valves. ~~The solar energy system components that are subjected to a vacuum while in operation or during shutdown shall be protected with vacuum relief valves. Where the piping configuration, equipment location, and valve outlets are located below the storage tank elevation the system shall be equipped with a vacuum relief valve at the highest point.~~

S-13.3.3 Space Heating. ~~Where a combination potable water heating and space heating system requires water for space heating at temperatures higher than 140°F (60°C), a thermostatic mixing valve that is in accordance with ASSE 1017 shall be provided to limit the water supplied to the potable hot water distribution system to a temperature of 140°F (60°C) or less.~~

S-13.3.2 Pressurized Vessels. Pressurized vessels shall be provided with overpressure protection by means of a listed pressure relief valve installed in accordance with the manufacturer's installation instructions.

S-13.3.3 Discharge Piping. The discharge piping serving a temperature relief valve, pressure relief valve, or combination of both shall have no valves, obstructions, or means of isolation and shall comply with the following:

(1) The discharge pipe shall equal the size of the valve outlet and shall discharge full size to the flood level of the area receiving the discharge and shall point downward;

(2) Materials shall be rated at not less than the operating temperature of the system and approved for such use;

(3) The discharge pipe shall discharge independently by gravity through an air gap into the drainage system or outside of the building with the end of the pipe not exceeding 2 feet (610 mm) and not less than 6 inches (152 mm) above the ground and pointing downward;

(4) The discharge pipe shall discharge in such a manner that does not cause personal injury or structural damage;

(5) No part of such discharge pipe shall be trapped or subject to freezing;

(6) The terminal end of the pipe shall not be threaded; and

(7) Discharge from a relief valve into a water heater pan is prohibited.

S-13.3.4 Vacuum Relief Valves. System components that are subjected to a vacuum while in operation or during shutdown shall be protected with vacuum relief valves. Where the piping configuration, equipment location, and valve outlets are located below the storage tank elevation, the system shall be equipped with a vacuum relief valve at the highest point.

S-13.3.5 Temperature Regulation. Where a system is capable of providing potable water at temperatures that exceed 140°F (60°C), a thermostatic mixing valve that is in accordance with ASSE 1017 shall be provided to limit the water

supplied to the potable hot water distribution system to a temperature of 140°F (60°C) or less.

S-13.4 Protection of System Components.

S-13.4.1 Materials. System components in contact with heat-transfer mediums shall be approved for such use. Components installed outdoors shall be resistant to ultraviolet radiation.

S-13.4.12 Corrosion. Solar thermal energy systems and components subject to corrosion shall be protected in an approved manner. Metal parts exposed to atmospheric conditions shall be of corrosion-resistant material.

S-13.4.23 Mechanical Damage. Portions of a solar thermal energy system installed where subjected to mechanical damage shall be guarded against such damage by being installed behind approved barriers or, where located within a garage, be by being elevated or located out of the normal path of a vehicle.

~~**S-13.4.3 Freeze Protection.** No solar thermal piping shall be installed or permitted outside of a building or in an exterior wall, unless, where necessary, adequate provision is made to protect such pipe from freezing. Freeze protection for solar thermal systems shall be provided in accordance with the following:~~

~~(1) Protection from freeze damage where the ambient temperature is less than 41°F (5°C) shall be provided for system components containing heat transfer liquids in an approved manner.~~

~~(2) The supplier of each system shall specify the limit ("Freeze Tolerance Limit") to the system's tolerance of freezing weather conditions.~~

~~(3) For systems that rely on manual intervention for freeze protection, the supplier shall specify the system's freeze tolerance limit based on exposure for 18 hours to a constant atmospheric temperature.~~

~~(4) For solar thermal systems where the collector fluid is potable water, not less than two freeze protection mechanisms shall be provided on each system. Manual intervention (e.g., draining, changing valve positions, etc.) shall be permitted as one mechanism. Not less than one freeze protection mechanism, in addition to manual intervention, shall be designed to protect components from freeze damage, in the event of power failure in an approved manner. Where approved, thermal mass of a system shall be permitted to be a form of freeze protection.~~

~~(5) Fittings, pipe slope, and collector shall be designed to allow for manual gravity draining and air filling of solar thermal system components and piping. Pipe slope for gravity draining shall be not less than $\frac{1}{4}$ inch per foot (20.8 mm/m) of horizontal length. This also applies to header pipes or absorber plate riser tubes internal to the collector. Where a means to drain the system is provided a drain valve shall be installed.~~

~~(6) At the time of installation, a label indicating the method of freeze protection for the system shall be attached to the system in a visible location. For systems which rely on manual intervention for freeze protection, such label shall indicate the minimum ambient temperature conditions (Freeze Tolerance Limit) below which owner action is recommended by the manufacturer's instructions.~~

S-13.4.4 **Freeze Protection.** Unless designed for such conditions, solar thermal systems and components that contain liquid as the heat transfer medium shall be protected from freezing, by means of fail-safe freeze protection in accordance with this Section, where the ambient temperature may be less than 46°F (8°C) .

S-13.4.4.1 **Antifreeze.** Antifreeze shall be used in accordance with the solar thermal system manufacturer's instructions.

S-13.4.4.2 **Drainback.** Drainback systems shall drain by gravity and shall be permitted to be installed in applications where the ambient temperature may not be less than -60°F (-51°C).

S-13.4.4.3 **Integral Collector Storage.** Integral collector storage systems shall be permitted to be installed in applications where the ambient temperature may not be less than 23°F (-5°C) and the duration of below-freezing episodes exceeding 18 hours. Exposed piping in a solar thermal system shall be protected with insulation having a thermal resistance of not less than R-5.0.

S-13.4.4.4 **Indirect Thermosiphon.** Indirect thermosiphon systems shall be permitted to be installed in applications where the ambient temperature may not be less than 23°F (-5°C). Exposed piping in a solar thermal system shall be protected with insulation having a thermal resistance of not less than R-5.

S-13.4.4.5 **Air Heating Systems.** Air solar heating systems shall be permitted to be used in accordance with the manufacturer's instructions.

S-13.4.4.6 **Labeling.** A label indicating the method of freeze protection for the system shall be attached to the system in a visible location.

S-13.4.4.7 **Piping.** Fittings, pipe slope, and collector shall be designed to allow for manual gravity draining and air filling of solar thermal system components and piping. Pipe slope for gravity draining shall be not less than 1/4 inch per foot (20.8 mm/m) of horizontal length. Collector header pipes or absorber plate riser tubes internal to the collector shall be sloped in accordance with the manufacturer's instructions. Where a means to drain the system is provided, a drain valve shall be installed.

S-13.4.45 **Water Hammer Protection.** Solar thermal systems where quick-acting valves are installed shall be provided with water hammer arrester(s) to absorb high pressures resulting from the quick closing of these valves. Water hammer arrestors shall be approved mechanical devices in accordance with the applicable standard(s) referenced in this Code and shall be installed as close as possible to quick-acting valves.

~~**S-13.4.5** **Materials.** Solar thermal system components in contact with heat transfer mediums shall be approved for such use. Solar thermal system components, installed outdoors, shall be resistant to UV radiation.~~

~~...~~

S-13.4.7 **Insulation.**

S-13.4.7.1 **General.** The temperature of surfaces within reach of building occupants shall not exceed 140°F (60°C) unless the surfaces are protected by insulation. Where sleeves are installed, the insulation shall continue full size through them. Coverings and insulation used for piping shall be of material approved for the

operating temperature of the system and the installation environment. Where installed in a plenum, the insulation, jackets and lap-seal adhesives, including pipe coverings and linings, shall have a flame spread index not to exceed 25 and a smoke-developed index not to exceed 50 where tested in accordance with ASTM E84 or UL 723.

S-13.4.7.2 Heat Loss. Piping, storage tanks, and circulating air ductwork shall be insulated. Ductwork and piping shall be permitted to not be insulated where exposed in conditioned spaces, and the heat loss from such ducts or piping does not otherwise contribute to the heating or cooling load within such space.

Exception: Low temperature, aboveground piping installed for swimming pools, spas, and hot tubs in accordance with the manufacturer's installation instructions unless such piping is located within a building.

S-13.4.7.3 Piping. Pipes and fittings, other than unions, flanges, or valves, shall be insulated. Insulation material shall be approved for continuous operating temperatures of not less than 220°F (104°C). [See Table S-13.4.7.3(1) through Table S-13.4.7.3(4)].

Table S-13.4.7.3(1)

MINIMUM PIPE INSULATION

<u>FLUID TEMPERATURE RANGE (°F)</u>	<u>PIPE DIAMETER (inches)</u>				
	<u>1 AND LESS</u>	<u>1.25 – 2</u>	<u>2.5 – 4</u>	<u>5 – 6</u>	<u>8 AND LARGER</u>
	<u>R-VALUE</u>				
<u>306–460</u>	<u>10</u>	<u>10</u>	<u>12</u>	<u>14</u>	<u>14</u>
<u>251–305</u>	<u>8</u>	<u>10</u>	<u>10</u>	<u>12</u>	<u>12</u>
<u>201–250</u>	<u>6</u>	<u>6</u>	<u>8</u>	<u>8</u>	<u>8</u>
<u>105–200</u>	<u>2</u>	<u>4</u>	<u>6</u>	<u>6</u>	<u>6</u>

Table S-13.4.7.3(2)

IRON PIPE AND COPPER TUBING INSULATION THICKNESS

TEMP DIFF. (DT) (°F)	INSULATION*		PIPE SIZE (inches)																							
			IRON PIPE SIZE												COPPER TUBING SIZE (nominal)											
			1/2	3/4	1	1 1/2	1 1/2	2	2 1/2	3	4	6	8	10	1 1/2	1 1/2	2	2 1/2	3	3 1/2	4	5	6			
240	Calcium Silicate	T	2	2 1/2	3	3 1/2	4	4 1/2	2 1/2	3 1/2	4	4 1/2	1 1/2	1 1/2	2 1/2	3	3 1/2	4	4 1/2	2 1/2	3	3 1/2	4	4 1/2	5	
		HL	25	25	25	25	25	25	40	38	39	40	23	25	25	24	24	25	25	39	40	40	38	40	40	
	Fibrous Glass	T	1	1 1/2	1 1/2	2	2	3	1 1/2	2	3	4	1	1	1	1 1/2	1 1/2	2	2	1 1/2	2	2 1/2	3	3 1/2	4	
230	Calcium Silicate	T	2	2 1/2	2 1/2	3	3 1/2	4	2 1/2	3	3 1/2	4	1 1/2	1 1/2	2	2 1/2	3	3 1/2	4	2	3	3	3 1/2	4	4	
		HL	23	24	25	25	25	25	39	40	40	40	21	23	24	24	25	24	23	40	38	40	39	38	40	
	Fibrous Glass	T	1	1 1/2	1 1/2	1 1/2	2	2 1/2	1 1/2	2	2 1/2	3	1	1	1	1 1/2	1 1/2	1 1/2	2	1 1/2	1 1/2	1 1/2	2	2 1/2	3	
220	Calcium Silicate	T	2	2	2 1/2	3	3 1/2	4	2 1/2	3	3 1/2	4	1	1 1/2	2	2	2 1/2	3	3 1/2	2	3	3	3 1/2	4	4	
		HL	23	25	24	24	24	24	37	39	40	40	25	22	23	25	25	25	25	38	37	39	40	38	40	
	Fibrous Glass	T	1	1 1/2	1 1/2	1 1/2	2	2 1/2	1 1/2	2	2 1/2	3	1/2	1	1	1	1 1/2	1 1/2	2	1 1/2	1 1/2	1 1/2	2	2 1/2	3	
210	Calcium Silicate	T	1 1/2	2	2 1/2	3	3	3 1/2	2	3	3 1/2	4	1	1	1 1/2	2	2 1/2	3	3 1/2	2	3	3	3 1/2	4	4	
		HL	24	25	24	22	25	25	40	39	38	40	24	24	25	24	25	24	25	36	38	40	40	38	40	
	Fibrous Glass	T	1	1	1 1/2	1 1/2	2	2 1/2	1 1/2	2	2	3	1/2	1/2	1/2	1	1 1/2	1 1/2	1 1/2	1	1 1/2	1 1/2	2	2 1/2	3	
200	Calcium Silicate	T	1 1/2	1 1/2	2	2 1/2	3	3 1/2	2	2 1/2	3	3 1/2	1	1	1 1/2	2	2	2 1/2	3	1 1/2	2	2 1/2	3	3 1/2	3 1/2	
		HL	23	24	25	25	23	25	38	38	40	40	23	23	24	23	25	25	25	39	40	39	38	38	40	
	Fibrous Glass	T	1	1	1 1/2	1 1/2	2	2	1 1/2	1 1/2	2	3	1/2	1/2	1/2	1	1 1/2	1 1/2	1 1/2	1	1 1/2	1 1/2	2	2	2 1/2	
180	Fibrous Glass	T	1/2	1/2	1	1 1/2	1 1/2	1 1/2	1	1 1/2	1 1/2	2 1/2	1/2	1/2	1/2	1	1	1	1 1/2	1	1	1	1 1/2	2	2	
		HL	24	24	21	19	22	25	37	33	40	38	20	20	20	18	22	23	22	32	36	39	35	34	38	
	Flexible Tubing	T	3/4	3/4	1	1 1/2	2	2	1	1 1/2	2	2 1/2	1/2	1/2	3/4	3/4	1	1 1/2	2	1	1	1 1/2	2	2 1/2	2 1/2	
170	Fibrous Glass	T	1/2	1/2	1	1 1/2	1 1/2	1 1/2	1	1 1/2	1 1/2	2 1/2	1/2	1/2	1/2	1/2	1	1	1 1/2	1	1	1	1 1/2	1 1/2	2	
		HL	22	23	20	18	21	23	35	31	38	35	18	18	19	25	21	22	22	30	34	37	32	38	36	
	Flexible Tubing	T	1/2	3/4	1	1 1/2	1 1/2	2	1	1 1/2	2	2 1/2	1/2	1/2	1/2	3/4	1	1 1/2	2	3/4	1	1 1/2	2	2	2 1/2	
160	Fibrous Glass	T	1/2	1/2	1	1	1 1/2	1 1/2	1	1	1 1/2	2	1/2	1/2	1/2	1/2	1/2	1	1	1	1	1	1	1 1/2	2	
		HL	16	18	19	25	20	23	34	40	36	40	18	18	18	24	25	21	25	29	33	37	40	37	35	
	Flexible Tubing	T	1/2	1/2	1	1 1/2	1 1/2	1	1	1 1/2	2	2 1/2	3/8	3/8	3/8	3/4	1	1	1 1/2	3/4	1	1	1 1/2	2	2 1/2	
150	Fibrous Glass	T	1/2	1/2	1	1	1	1 1/2	1	1	1 1/2	2	1/2	1/2	1/2	1/2	1/2	1	1	1	1	1	1	1 1/2	1 1/2	
		HL	20	21	18	23	24	21	32	38	34	38	17	18	19	23	23	20	24	40	31	33	37	35	40	
	Flexible Tubing	T	1/2	3/4	3/4	1	1	1 1/2	3/4	1	1 1/2	2	3/8	3/8	3/8	1/2	3/4	3/4	1	3/4	3/4	1	1 1/2	1 1/2	2	
140	Fibrous Glass	T	1/2	1/2	1	1	1	1	1	1	1 1/2	2	1/2	1/2	1/2	1/2	1/2	1	1	1	1	1	1	1 1/2	1 1/2	
		HL	19	19	17	22	22	25	29	35	32	35	15	15	16	21	21	18	22	37	28	31	35	32	27	
	Flexible Tubing	T	1/2	1/2	3/4	1	1	1 1/2	3/4	1	1 1/2	2	3/8	3/8	3/8	1/2	1/2	3/4	1	1/2	3/4	3/4	1 1/2	1 1/2	2	
		HL	22	25	21	23	24	23	37	37	39	39	18	19	21	23	22	22	23	38	38	39	38	40	39	

130	Fibrous	<i>T</i>	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	1	1	1	1	1	$1\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	1	$\frac{1}{2}$	$\frac{1}{2}$	1	1	1	$1\frac{1}{2}$
	Glass	<i>HL</i>	17	17	23	25	20	23	26	31	38	40	14	14	14	19	21	24	20	33	38	25	31	37	34
	Flexible	<i>T</i>	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{1}{2}$	1	1	1	$\frac{3}{4}$	1	$1\frac{1}{2}$	2	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{1}{2}$	$\frac{3}{4}$	$\frac{3}{4}$	$\frac{1}{2}$	$\frac{3}{4}$	$\frac{3}{4}$	1	$1\frac{1}{2}$	2
	Tubing	<i>HL</i>	21	24	25	21	22	25	35	35	40	37	17	18	19	20	21	21	25	36	36	37	34	39	37

Table S-13.4.7.3(2) (continued)

IRON PIPE AND COPPER TUBING INSULATION THICKNESS

TEMP DIFF. (DT) (°F)	INSULATION*		PIPE SIZE (inches)																							
			IRON PIPE SIZE												COPPER TUBING SIZE (nominal)											
			$\frac{1}{2}$	$\frac{3}{4}$	1	$1\frac{1}{2}$	$1\frac{1}{2}$	2	$2\frac{1}{2}$	3	4	6	$\frac{3}{8}$	$\frac{1}{2}$	$\frac{3}{4}$	1	$1\frac{1}{2}$	$1\frac{1}{2}$	2	$2\frac{1}{2}$	3	$3\frac{1}{2}$	4	5	6	
120	Fibrous	T	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	1	1	$\frac{1}{2}$	1	1	$1\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	1	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	1	1	1	
	Glass	HL	16	16	21	23	18	21	38	29	35	37	13	13	14	17	18	23	18	31	35	40	29	35	40	
	Flexible	T	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{1}{2}$	$\frac{3}{4}$	1	$\frac{3}{4}$	$\frac{3}{4}$	1	$\frac{1}{2}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{1}{2}$	$\frac{3}{4}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{3}{4}$	1	$1\frac{1}{2}$	$1\frac{1}{2}$	
	Tubing	HL	19	22	23	25	23	23	32	39	38	40	16	16	17	19	24	24	23	33	38	34	32	38	40	
110	Fibrous	T	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	1	1	$\frac{1}{2}$	1	1	1	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	1	1		
	Glass	HL	14	15	19	21	17	19	34	26	32	38	12	12	13	16	16	20	24	28	32	36	39	31	36	
	Flexible	T	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{1}{2}$	$\frac{3}{4}$	$\frac{3}{4}$	$\frac{1}{2}$	$\frac{3}{4}$	1	$1\frac{1}{2}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{1}{2}$	$\frac{3}{4}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	1	1	1	
	Tubing	HL	17	20	21	23	22	25	37	36	35	36	14	15	16	17	22	22	21	30	35	40	29	35	40	
80	Fibrous	T	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	1	1		
	Glass	HL	10	11	15	16	21	24	28	38	40	38	9	9	10	12	14	19	21	25	37	38	39	34	36	
	Flexible	T	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{3}{8}$	$\frac{1}{2}$	$\frac{3}{4}$	1	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{1}{2}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{3}{4}$	
	Tubing	HL	12	15	15	23	16	22	39	35	25	37	10	11	12	12	16	23	19	30	34	40	31	36	40	
70	Fibrous	T	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	1	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	
	Glass	HL	9	10	13	14	18	19	23	29	35	31	8	9	9	10	12	16	18	22	27	32	34	41	50	
	Flexible	T	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{3}{8}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{3}{4}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{3}{4}$	
	Tubing	HL	11	13	13	21	14	20	37	33	39	40	9	10	11	11	14	21	23	26	29	37	29	34	38	

For SI units: 1 inch = 25.4 mm, °C = (°F-32)/1.8, 1000 British thermal units per hour = 0.293kW

*T = Thickness (inches), HL = Heat loss (Btu/h)

Table S-13.4.7.3(3)

UNIVERSAL PIPE INSULATION THICKNESS

BASED ON RADIUS AND IRON PIPE SIZE

IPS (inches)	Pipe Diameter (inches)	<i>r</i> ₁	$\frac{1}{2}$ INCH THICK*			$\frac{3}{4}$ INCH THICK*			1 INCH THICK*			$1\frac{1}{2}$ INCHES THICK*			2 INCHES THICK*		
			$r_2 \cdot \ln \frac{r_2}{r_1}$	A	<i>r</i> ₂	$r_2 \cdot \ln \frac{r_2}{r_1}$	A	<i>r</i> ₂	$r_2 \cdot \ln \frac{r_2}{r_1}$	A	<i>r</i> ₂	$r_2 \cdot \ln \frac{r_2}{r_1}$	A	<i>r</i> ₂	$r_2 \cdot \ln \frac{r_2}{r_1}$	A	<i>r</i> ₂
$\frac{1}{2}$	0.840	0.420	0.72	0.48	0.92	1.21	0.62	1.18	1.77	0.75	1.44	3.12	1.05	2.00	4.46	1.31	2.50
$\frac{3}{4}$	1.050	0.525	0.69	0.54	1.03	0.96	0.62	1.18	1.44	0.75	1.44	2.67	1.05	2.00	3.90	1.31	2.50
1	1.315	0.657	0.65	0.61	1.16	1.11	0.75	1.44	1.71	0.92	1.75	2.77	1.18	2.25	4.01	1.46	2.78

1¼	1.660	0.830	0.63	0.70	1.33	1.29	0.86	1.64	1.31	0.92	1.75	2.76	1.31	2.50	3.36	1.46	2.78
1½	1.990	0.950	0.53	0.63	1.39	1.06	0.92	1.75	1.49	1.05	2.00	2.42	1.31	2.50	2.98	1.46	2.78
2	2.375	1.187	0.62	0.90	1.71	1.02	1.04	1.99	1.43	1.18	2.25	2.37	1.46	2.78	3.39	1.73	3.31
2½	2.875	1.437	0.58	1.02	1.94	0.99	1.17	2.24	1.38	1.31	2.50	1.84	1.46	2.78	2.76	1.73	3.31
3	3.500	1.750	0.56	1.18	2.25	0.87	1.29	2.48	1.29	1.46	2.78	2.11	1.73	3.31	2.96	2.00	3.81
3½	4.000	2.000	0.52	1.29	2.48	0.89	1.46	2.78	1.67	1.73	3.31	1.67	1.73	3.31	2.46	2.00	3.81
4	4.500	2.250	0.59	1.46	2.78	1.25	1.72	3.29	1.28	1.73	3.31	2.01	2.00	3.81	2.80	2.26	4.31
6	6.625	3.312	0.64	2.05	3.90	0.83	2.13	4.06	1.13	2.26	4.31	1.79	2.52	4.81	2.60	2.82	5.38

For SI units: 1 inch = 25.4 mm, 1 square inch = 0.000645 m²

*A = Area (square inches), r_1 = Inside radius (inches), r_2 = Outside radius (inches)

Table S-13.4.7.3(4)

DESIGN VALUES FOR THERMAL CONDUCTIVITY (k) OF INDUSTRIAL INSULATION^{3, 4, 5}

FORM MATERIAL COMPOSITION ³	ACCEPTED MAX TEMP FOR USE (°F)	TYPICAL DENSITY (lb/ft ³)	TYPICAL THERMAL CONDUCTIVITY (k) AT MEAN TEMP (°F)														
			-100	-75	-50	-25	0	25	50	75	100	200	300	500	700		
BLOCKS, BOARDS & PIPE INSULATION																	
ASBESTOS																	
Laminated asbestos paper	700	30	—	—	—	—	—	—	—	—	—	0.40	0.45	0.50	0.60	—	—
Corrugated & laminated asbestos paper																	
4-ply	300	11-13	—	—	—	—	—	—	—	0.54	0.57	0.68	—	—	—	—	—
6-ply	300	15-17	—	—	—	—	—	—	—	0.49	0.51	0.59	—	—	—	—	—
6-ply	300	18-20	—	—	—	—	—	—	—	0.47	0.49	0.57	—	—	—	—	—
MOLDED AMOSITE & BINDER	1500	15-18	—	—	—	—	—	—	—	—	0.32	0.37	0.42	0.52	0.6	—	—
85 PERCENT MAGNESIA	600	11-12	—	—	—	—	—	—	—	—	0.35	0.38	0.42	—	—	—	—
CALCIUM SILICATE	1200	11-13	—	—	—	—	—	—	—	—	0.38	0.41	0.44	0.52	0.6	—	—
	1800	12-15	—	—	—	—	—	—	—	—	—	—	—	0.63	0.7	—	—
CELLULAR GLASS	800	9	—	—	0.32	0.33	0.35	0.36	0.38	0.40	0.42	0.48	0.55	—	—	—	—
DIATOMACEOUS SILICA	1600	21-22	—	—	—	—	—	—	—	—	—	—	—	0.64	0.6	—	—
	1900	23-25	—	—	—	—	—	—	—	—	—	—	—	0.70	0.7	—	—
MINERAL FIBER																	
Glass, Organic bonded, block and boards	400	3-10	0.16	0.17	0.18	0.19	0.20	0.22	0.24	0.25	0.26	0.33	0.40	—	—	—	—
Nonpinking binder	1000	3-10	—	—	—	—	—	—	—	—	0.26	0.31	0.38	0.52	—	—	—
Pipe insulation, slag or glass	350	3-4	—	—	—	—	0.20	0.21	0.22	0.23	0.24	0.29	—	—	—	—	—
	500	3-10	—	—	—	—	0.20	0.22	0.24	0.25	0.26	0.33	0.40	—	—	—	—
Inorganic bonded-block	1000	10-15	—	—	—	—	—	—	—	—	0.33	0.38	0.45	0.55	—	—	—
	1800	15-24	—	—	—	—	—	—	—	—	0.32	0.37	0.42	0.52	0.6	—	—
Pipe insulation, slag or glass	1000	10-15	—	—	—	—	—	—	—	—	0.33	0.38	0.45	0.55	—	—	—
MINERAL FIBER																	
Resin binder	—	15	—	—	0.23	0.24	0.25	0.26	0.28	0.29	—	—	—	—	—	—	—
RIGID POLYSTYRENE																	
Extruded, Refrigerant 12 exp	170	3.5	0.16	0.16	0.15	0.16	0.16	0.17	0.18	0.19	0.20	—	—	—	—	—	—
Extruded, Refrigerant 12 exp	170	2.2	0.16	0.16	0.17	0.16	0.17	0.18	0.19	0.20	—	—	—	—	—	—	—
Extruded	170	1.8	0.17	0.18	0.19	0.20	0.21	0.23	0.24	0.25	0.27	—	—	—	—	—	—
Molded beads	170	1	0.18	0.20	0.21	0.23	0.24	0.25	0.26	0.28	—	—	—	—	—	—	—
POLYURETHANE ^{2, 4}																	

Refrigerant 11 exp	210	1.5-2.5	0.16	0.17	0.18	0.18	0.18	0.17	0.16	0.16	0.17	—	—	—	—
RUBBER, Rigid Foamed	150	4.5	—	—	—	—	—	0.20	0.21	0.22	0.23	—	—	—	—
VEGETABLE & ANIMAL FIBER															
Wool felt (pipe insulation)	180	20	—	—	—	—	—	0.28	0.30	0.31	0.33	—	—	—	—
INSULATING CEMENTS															
MINERAL FIBER															
(Rock, slag, or glass)															
With colloidal clay binder	1800	24-30	—	—	—	—	—	—	—	—	0.49	0.55	0.61	0.73	0.8
With hydraulic setting binder	1200	30-40	—	—	—	—	—	—	—	—	0.75	0.80	0.85	0.95	—
LOOSE FILL															
Cellulose insulation (milled pulverized paper or wood pulp)	—	2.5-3	—	—	—	—	—	—	0.26	0.27	0.29	—	—	—	—
Mineral fiber, slag, rock, or glass	—	2-5	—	—	0.19	0.21	0.23	0.25	0.26	0.28	0.31	—	—	—	—
Perlite (expanded)	—	5-8	0.25	0.27	0.29	0.30	0.34	0.35	0.37	0.39	—	—	—	—	—
Silica aerogel	—	7.6	—	—	0.13	0.14	0.15	0.15	0.16	0.17	0.18	—	—	—	—
Vermiculite (expanded)	—	7-8.2	—	—	0.39	0.40	0.42	0.44	0.45	0.47	0.49	—	—	—	—
	—	4-6	—	—	0.34	0.35	0.38	0.40	0.42	0.44	0.46	—	—	—	—

For SI units: °C = (°F-32)/1.8, 1 pound per cubic foot = 16.01846 kg/m³, 1 inch = 25.4 mm, 1 British thermal unit inch per hour square foot degree fahrenheit = 0.1 [W/(m•K)]

Notes:

- ¹ These temperatures are generally accepted as maximum. Where operating temperature approaches these limits, follow the manufacturer's recommendations.
- ² Values are for aged board stock.
- ³ Representative values for dry materials as selected by ASHRAE TC 4.4, Insulation and Moisture Barriers. They are intended as design (not specification values for materials of building construction for normal use). For thermal resistance of a particular product, use the value supplied by the manufacturer or by unbiased tests.
- ⁴ Some polyurethane foams are formed by means that produce a stable product (with respect to *k*), but most are blown with refrigerant and will change with time.
- ⁵ Thermal conductivity (*k*) of industrial insulation shall be expressed in British thermal unit inch per hour square foot degree fahrenheit [Btu•in/(h•ft²•°F)] [W/(m•K)].

S-13.4.7.4 Fittings. Fittings shall be insulated with mitered sections,

molded fittings, insulating cement, or flexible insulation.

S-13.4.7.5 Installation. Insulation shall be finished with a jacket or

facing with the laps sealed with adhesives or staples so as to secure the insulation on the pipe. Insulation jacket seams shall be on the underside of the piping and shall overlap in accordance with the manufacturer's installation instructions. Joints and seams shall be sealed with a sealant that is approved for both the material and

environmental conditions. In lieu of jackets, molded insulation shall be permitted to be secured with 16 gauge galvanized wire ties not exceeding 9 inches (229 mm) on center.

S-13.4.7.5.1 Exterior Applications. Insulation for exterior applications shall be finished with an approved jacket or facing with the surfaces and laps sealed. Jacketing, facing, and tape used for exterior applications shall be designed for such use. Where flexible insulation is used, it shall be wrapped and sealed against water penetration. Insulation used for exterior applications shall be resistant to extreme temperatures, UV exposure, and moisture.

S-14 Specific Requirements.

S-14.1 Electrical.

S-14.1.1 Wiring. Electrical connections, wiring, and devices shall be installed in accordance with the ~~Los Angeles County Electrical Code~~ NFPA 70.

Electrical equipment, appliances, and devices installed in areas that contain flammable vapors or dusts shall be of a type approved for such environment.

...

S-14.2 Flow Directions. ~~Solar thermal systems shall have flow directions indicated on system components and piping or shall have flow directions indicated on a diagrammatic representation of the system as installed, and permanently affixed to the system hardware in a readily visible location.~~ Flow directions shall be permanently affixed on the solar thermal system.

...

S-14.5 Dry Storage Systems.

...

S-14.5.5 Combustibles Within Ducts or Plenums. ~~Materials exposed within ducts or plenums shall be noncombustible or shall have a flame spread index not to exceed 25 and a smoke developed index not to exceed 50 where tested as a composite product in accordance with ASTM E 84 or UL 723.~~

S-15 Solar Thermal Systems for Swimming Pool, Spas and Hot Tubs.

S-15.1 Applicability. ~~This Section applies to the installation and construction of solar thermal systems for swimming pools, spas, and hot tubs.~~

S-15.2₁ Water Chemistry. Where water from a swimming pool, spa or hot tub is heated by way of circulation through solar collectors, the chemistry of such water shall comply with the requirements of Section S-15.2 and ~~Table S-15.2~~ and shall be filtered in accordance with Sections S-15.3 and S-15.3.1 of this Code.

S-15.2 Parameters. Parameters for chemicals used within a swimming pool, spa, or hot tub shall be in accordance with Table S-15.2.

...

S-16 Certificate of Compliance. Upon completion of the solar thermal energy system, the permittee shall sign a Certificate of Compliance with this Code.

...

S-17**Referenced Standards.** The standards listed in Table S-17

are intended for use in the design, testing, and installation of materials, devices, appliances, and equipment regulated by this Chapter.

TABLE S-17
REFERENCED STANDARDS

STANDARD NUMBER	STANDARD TITLE	APPLICATION
ASCE 25-2006*	Earthquake Actuated Automatic Gas Shutoff Devices	Fuel Gas
ASHRAE 90.1-2010*	Energy Standard for Buildings Except Low-Rise Residential Buildings	Energy
ASHRAE 93-2010*	Methods of Testing to Determine the Thermal Performance of Solar Collectors	Testing
ASHRAE 95-1981*	Thermal Testing of 32 Residential Solar Water Heating Systems	Testing
ASHRAE 96-1980 (R1989)*	Thermal Performance of Unglazed Flat-Plate Liquid-Type Solar Collectors	Testing, Collector
ASME A13.1-2007*	Scheme for the Identification of Piping Systems	Piping
ASME A112.1.2-2004*	Air Gaps in Plumbing Systems (For Plumbing Fixtures and Water-Connected Receptors)	Fittings
ASME A112.1.3-2000 (R2010)*	Air Gap Fittings for Use with Plumbing Fixtures, Appliances, and Appurtenances	Fittings
ASME A112.18.1-2005/CSA B125.1-2005	Plumbing Supply Fittings	Fittings
ASME A112.18.2-2005/CSA B125.2-2005	Plumbing Waste Fittings	Fittings
ASME A112.18.6-2009/CSA B 125.6-2009*	Flexible Water Connectors	Piping
ASME B1.20.1 1983 (R2006)*	Pipe Threads, General Purpose, Inch	Joints
ASME B16.3-2006*	Malleable-Iron Threaded Fittings: Classes 150 and 300	Fittings
ASME B16.4-2006*	Gray Iron Threaded Fittings (Classes 125 and 250)	Fittings
ASME B16.5-2009*	Pipe Flanges and Flanged Fittings: NPS $\frac{1}{2}$ -through NPS 24 Metric/Inch	Fittings
ASME B16.12-2009*	Cast Iron Threaded Drainage Fittings	Fittings
ASME B16.15-2006*	Cast Copper Alloy Threaded Fittings: Classes 125 and 250	Fittings
ASME B16.18-2001 (R2005)*	Cast Copper Alloy Solder Joint Pressure Fittings	Fittings
ASME B16.21-2005*	Nonmetallic Flat Gaskets for Pipe Flanges	Joints
ASME B16.22-2001 (R2010)*	Wrought Copper and Copper Alloy Solder Joint Pressure Fittings	Fittings
ASME B16.23-2002 (R2006)*	Cast Copper Alloy Solder Joint Drainage Fittings: DWV	Fittings

STANDARD NUMBER	STANDARD TITLE	APPLICATION
ASME B16.24-2006*	Cast Copper Alloy Pipe Flanges and Flanged-Fittings: Classes 150, 300, 600, 900, 1500 and 2500	Fittings
ASME B16.26-2006*	Cast Copper Alloy Fittings for Flared Copper Tubes	Fittings
ASME B16.29-2007*	Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings-DWV	Fittings
ASME B16.33-2002 (R2007)*	Manually Operated Metallic Gas Valves for use in Gas Piping Systems up to 125 psi (Sizes NPS $\frac{1}{2}$ —NPS 2)	Valves
ASME B16.34-2009*	Valves—Flanged, Threaded, and Welding-End	Valves
ASME B16.47-2006*	Large Diameter Steel Flanges: NPS 26-Through NPS 60 Metric/Inch	Fittings
ASME BPVC Section IV-2010*	Rules for Construction of Heating Boilers	Miscellaneous
ASME BPVC Section VIII-2010*	Rules for Construction of Pressure Vessels-Division 1	Miscellaneous
ASME BPVC Section IX-2010*	Welding and Brazing Qualifications	Certification
ASME BPVC Section X-2007*	Fiber-Reinforced Plastic Pressure Vessels	Pressure Vessel Construction, Pressure Vessels
ASME SA194-2010*	Carbon and Alloy Steel Nuts for Bolts for High-Pressure or High-Temperature Service or Both	Mounting
ASSE 1001-2008*	Atmospheric-Type Vacuum Breakers	Backflow Protection
ASSE 1002-2008*	Anti-Siphon Fill Valves for Water Closet Tanks	Backflow Protection
ASSE 1003-2009*	Water Pressure Reducing Valves for Domestic Water Distribution Systems	Valves
ASSE 1010-2004*	Water Hammer Arrestors	Water Supply Component
ASSE 1013-2009*	Reduced-Pressure Principle Backflow Preventers and Reduced Pressure Principle Fire Protection Backflow Preventers	Backflow Protection
ASSE 1015-2009*	Double Check Backflow Prevention Assemblies and Double Check Fire Protection Backflow Prevention Assemblies	Backflow Protection
ASSE 1017-2009*	Temperature Actuated Mixing Valves for Hot Water Distribution Systems	Valves
ASSE 1018-2001*	Trap Seal Primer Valves—Potable Water-Supplied	Valves
ASSE 1019-2004*	Vacuum Breaker Wall Hydrants, Freeze-Resistant, Automatic Draining Type	Backflow Protection
ASSE 1020-2004*	Pressure Vacuum Breaker Assembly	Backflow Protection
ASSE 1022-2003*	Backflow Preventer for Beverage Dispensing Equipment	Backflow Protection
ASSE 1044-2001*	Trap Seal Primer Devices-Drainage Types and Electronic Design Types	DWV Components
ASSE 1047-2009*	Reduced Pressure Detector Fire Protection Backflow Prevention Assemblies	Backflow Protection
ASSE 1048-2009*	Double Check Detector Fire Protection Backflow Prevention Assemblies	Backflow Protection
ASSE 1052-2004*	Hose Connection Backflow Preventers	Backflow Protection
ASSE 1056-2001*	Spill Resistant Vacuum Breakers	Backflow Protection
ASSE 1061-2006*	Push-Fit Fittings	Fittings
ASSE 1079-2005	Dielectric Pipe Unions	Joints

STANDARD NUMBER	STANDARD TITLE	APPLICATION
ASSE Series 5000-2009*	Cross-Connection Control Professional Qualifications	Certification
ASTM A 53/A 53M-2010	Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded, and Seamless	Piping, Ferrous
ASTM A 74-2009	Cast Iron Soil Pipe and Fittings	Piping, Ferrous
ASTM A 126-2004 (R2009)	Gray Iron Castings for Valves, Flanges, and Pipe Fittings	Piping, Ferrous
ASTM A 269-2010	Seamless and Welded Austenitic Stainless Steel Tubing for General Service	Piping, Ferrous
ASTM A 312-2009	Seamless, Welded, and Heavily Cold-Worked Austenitic Stainless Steel Pipes	Piping, Ferrous
ASTM A 377-2003 (R2008) ^{e1}	Ductile Iron Pressure Pipe	Piping, Ferrous
ASTM A 518-1999 (R2008)	Corrosion-Resistant High-Silicon Iron Castings	Piping, Ferrous
ASTM A 733-2003 (R2009) ^{e1}	Welded and Seamless Carbon Steel and Austenitic Stainless Steel Pipe Nipples	Piping, Ferrous
ASTM A 861-2004 (R2008)	High-Silicon Iron Pipe and Fittings (Note 1)	Piping, Ferrous
ASTM B 32-2008	Solder Metal (Note 2)	Joints
ASTM B 42-2010	Seamless Copper Pipe, Standard Sizes	Piping, Copper Alloy
ASTM B 43-2009	Seamless Red Brass Pipe, Standard Sizes	Piping, Copper Alloy
ASTM B 75-2002 (R2010)	Seamless Copper Tube	Piping, Copper Alloy
ASTM B 88-2009	Seamless Copper Water Tube	Piping, Copper Alloy
ASTM B 135-2010	Seamless Brass Tube	Piping, Copper Alloy
ASTM B 251-2010	General Requirements for Wrought Seamless Copper and Copper-Alloy Tube	Piping, Copper Alloy
ASTM B 302-2007	Threadless Copper Pipe, Standard Sizes	Piping, Copper Alloy
ASTM B 306-2009	Copper Drainage Tube (DWV)	Piping, Copper Alloy
ASTM B 447-2007	Welded Copper Tube	Piping, Copper Alloy
ASTM B 584-2009a	Copper-Alloy Sand Castings for General Applications (Note 3)	Piping, Copper Alloy
ASTM B 587-2008	Welded Brass Tube	Piping, Copper Alloy
ASTM B 687-1999 (R2005) ^{e1}	Brass, Copper, and Chromium-Plated Pipe Nipples	Piping, Copper Alloy
ASTM B 813-2010	Liquid and Paste Fluxes for Soldering of Copper and Copper-Alloy Tube	Joints
ASTM B 828-2002 (R2010)	Making Capillary Joints by Soldering of Copper and Copper-Alloy Tube and Fittings	Joints
ASTM C 296-2000 (R2009) ^{e1}	Asbestos-Cement Pressure Pipe	Piping, Non-Metallic
ASTM C 411-2005	Hot-Surface Performance of High-Temperature Thermal Insulation	Thermal Insulating Materials
ASTM C 425-2004 (R2009)	Compression Joints for Vitrified Clay Pipe and Fittings	Joints
ASTM C 443-2010	Joints for Concrete Pipe and Manholes, Using Rubber Gaskets	Joints
ASTM C 564-2009a	Rubber Gaskets for Cast Iron Soil Pipe and Fittings	Joints
ASTM C 700-2011	Vitrified Clay Pipe, Extra Strength, Standard Strength, and Perforated	Piping, Non-Metallic
ASTM C 1277-2009a	Shielded Couplings Joining Hubless Cast Iron Soil Pipe and Fittings	Joints
ASTM D 56-2005*	Flash Point by the Tag Closed Cup Tester	Testing
ASTM D 93-2010a	Flash Point by Pensky-Martens Closed Cup Tester	Testing

STANDARD-NUMBER	STANDARD-TITLE	APPLICATION
ASTM D 635-2006	Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position	Testing
ASTM D 1785-2006*	Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120	Piping, Plastic
ASTM D 1869-1995 (R2010)	Rubber Rings for Asbestos-Cement Pipe	Joints
ASTM D 2235-2004 (R2011)*	Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings	Joints
ASTM D 2239-2003*	Polyethylene (PE) Plastic Pipe, (SDR-PR)-Based on Controlled Inside Diameter	Piping, Plastic
ASTM D 2241-2009*	Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR-Series)	Piping, Plastic
ASTM D 2464-2006*	Threaded Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80 (Note 1)	Fittings
ASTM D 2466-2006*	Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40 (Note 1)	Fittings
ASTM D 2467-2006*	Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80 (Note 1)	Fittings
ASTM D 2513-2011*	Polyethylene (PE) Gas Pressure Pipe, Tubing, and Fittings (Note 1)	Piping, Plastic
ASTM D 2564-2004 (R2009)*	Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems	Joints
ASTM D 2609-2002 (R2008)*	Plastic Insert Fittings for Polyethylene (PE) Plastic Pipe (Note 1)	Fittings
ASTM D 2657-2007*	Heat Fusion Joining of Polyolefin Pipe and Fittings (Note 1)	Joints
ASTM D 2672-1996a (R2009)*	Joints for IPS PVC Pipe Using Solvent-Cement	Joints
ASTM D 2683-2010*	Socket-Type Polyethylene Fittings for Outside Diameter-Controlled Polyethylene Pipe and Tubing	Fittings
ASTM D 2737-2003*	Polyethylene (PE) Plastic Tubing	Piping, Plastic
ASTM D 2846-2009b*	Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Hot- and Cold-Water Distribution-Systems	Piping, Plastic
ASTM D 2855-1996 (R2010)*	Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings	Joints
ASTM D 3035-2010*	Polyethylene (PE) Plastic Pipe (DR-PR)-Based on Controlled Outside Diameter	Piping, Plastic
ASTM D 3139-1998 (R2011)*	Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals	Joints
ASTM D 3261-2010a*	Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing	Fittings
ASTM D 3278-1996 (R2011)*	Flash Point of Liquids by Small Scale Closed-Cup Apparatus	Testing
ASTM E 84-2010b*	Surface Burning Characteristics of Building-Materials	Miscellaneous
ASTM E 2231-2009	Specimen Preparation and Mounting of Pipe and Duct Insulation Materials to Assess Surface Burning Characteristics	Pipe Insulation-
ASTM F 402-2005*	Safe Handling of Solvent Cements, Primers, and Cleaners Used for Joining Thermoplastic Pipe and Fittings	Joints
ASTM F 437-2009*	Threaded Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80	Fittings

STANDARD NUMBER	STANDARD TITLE	APPLICATION
ASTM F 438-2009*	Socket-Type Chlorinated Poly (Vinyl-Chloride) (CPVC) Plastic Pipe Fittings, Schedule 40	Fittings
ASTM F 439-2009*	Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80	Fittings
ASTM F 441-2009*	Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe, Schedules 40 and 80	Piping, Plastic
ASTM F 442-2009*	Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe (SDR-PR)	Piping, Plastic
ASTM F 480-2006b ^{61*}	Thermoplastic Well Casing Pipe and Couplings Made in Standard Dimension Ratios (SDR), Schedule 40 and Schedule 80	Piping, Plastic
ASTM F 493-2010*	Solvent Cements for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe and Fittings	Joints
ASTM F 628-2008*	Acrylonitrile-Butadiene-Styrene (ABS) Schedule 40 Plastic Drain, Waste, and Vent Pipe with a Cellular Core (Note 1)	Piping, Plastic
ASTM F 656-2010*	Primers for Use in Solvent Cement Joints of Poly (Vinyl Chloride) (PVC) Plastic Pipe and Fittings	Joints
ASTM F 876-2010*	Crosslinked Polyethylene (PEX) Tubing	Piping, Plastic
ASTM F 877-2007*	Crosslinked Polyethylene (PEX) Plastic Hot- and Cold-Water Distribution Systems	Piping, Plastic
ASTM F 891-2010*	Coextruded Poly (Vinyl Chloride) (PVC) Plastic Pipe with a Cellular Core	Piping, Plastic
ASTM F 1055-1998 (R2006)*	Electrofusion Type Polyethylene Fittings for Outside Diameter Controlled Polyethylene Pipe and Tubing	Fittings
ASTM F 1281-2007*	Crosslinked Polyethylene/Aluminum/Crosslinked Polyethylene (PEX-AL-PEX) Pressure Pipe	Piping, Plastic
ASTM F 1282-2010*	Polyethylene/Aluminum Polyethylene (PE-AL-PE) Composite Pressure Pipe	Piping, Plastic
ASTM F 1807-2010 ^{61*}	Metal Insert Fittings Utilizing a Copper Crimp Ring for SDR9 Cross-linked Polyethylene (PEX) Tubing and SDR9 Polyethylene of Raised Temperature (PE-RT) Tubing	Fittings
ASTM F 1960-2010*	Cold Expansion Fittings with PEX Reinforcing Rings for Use with Cross-linked Polyethylene (PEX) Tubing	Fittings
ASTM F 1961-2009*	Metal Mechanical Cold Flare Compression Fittings with Disc Spring for Crosslinked Polyethylene (PEX) Tubing	Fittings
ASTM F 1970-2005*	Special Engineered Fittings, Appurtenances or Valves for Use in Poly (Vinyl Chloride) (PVC) or Chlorinated Poly (Vinyl Chloride) (CPVC) Systems	Piping, Plastic
ASTM F 1974-2009*	Metal Insert Fittings for Polyethylene/Aluminum Polyethylene and Crosslinked Polyethylene/Aluminum/Crosslinked Polyethylene Composite Pressure Pipe	Fittings
ASTM F 2080-2009*	Cold Expansion Fittings with Metal Compression Sleeves for Crosslinked Polyethylene (PEX) Pipe	Fittings

STANDARD NUMBER	STANDARD TITLE	APPLICATION
ASTM F 2098-2008*	Stainless Steel Clamps for Securing SDR9 Cross-linked Polyethylene (PEX) Tubing to Metal Insert and Plastic Insert Fittings	Joints
ASTM F 2159-2010*	Plastic Insert Fittings Utilizing a Copper Crimp Ring for SDR9 Cross-linked Polyethylene (PEX) Tubing and SDR9 Polyethylene of Raised Temperature (PE-RT) Tubing	Joints
ASTM F 2262-2009*	Crosslinked Polyethylene/Aluminum/ Crosslinked Polyethylene Tubing OD Controlled SDR9	Piping, Plastic
ASTM F 2389-2010	Pressure-Rated Polypropylene (PP) Piping Systems	Piping, Plastic
ASTM F 2434-2009*	Metal Insert Fittings Utilizing a Copper Crimp Ring for SDR9 Cross-linked Polyethylene (PEX) Tubing and SDR9 Cross-linked Polyethylene/Aluminum/Cross-linked Polyethylene (PEX-AL-PEX) Tubing	Pipe Fittings
ASTM F 2735-2009	Plastic Insert Fittings for SDR9 Cross-linked Polyethylene (PEX) and Polyethylene of Raised Temperature (PE-RT) Tubing	Fittings
ASTM F 2769-2009	Polyethylene of Raised Temperature (PE-RT) Plastic Hot and Cold Water Tubing and Distribution Systems	Piping and Fittings, Plastic
AWS A5.8-2004*	Filler Metals for Brazing and Braze Welding	Joints
AWS A5.9-2006*	Bare Stainless Steel Welding Electrodes and Rods	Joints
AWS B2.2-2010*	Brazing Procedure and Performance Qualification	Certification
AWWA C110-2008*	Ductile Iron and Gray Iron Fittings	Fittings
AWWA C111-2007*	Rubber Gasket Joints for Ductile Iron Pressure Pipe and Fittings (same as ANSI A-21.11)	Joints
AWWA C151-2009*	Ductile Iron Pipe, Centrifugally Cast	Piping, Ferrous
AWWA C153-2006*	Ductile Iron Compact Fittings for Water Service	Fittings
AWWA C203-2008*	Coal-Tar Protective Coatings and Linings for Steel Water Pipelines—Enamel and Tape—Hot Applied	Miscellaneous
AWWA C213-2007*	Fusion-Bonded Epoxy Coating for the Interior and Exterior of Steel Water Pipelines	Miscellaneous
AWWA C215-2010*	Extruded Polyolefin Coatings for the Exterior of Steel Water Pipelines	Miscellaneous
AWWA C500-2009*	Metal-Seated Gate Valves for Water Supply Service	Valves
AWWA C507-2005*	Ball Valves, 6 in. through 48 in. (150 mm through 1200 mm)	Valves
AWWA C510-2007*	Double Check Valve Backflow Prevention Assembly	Backflow Protection
AWWA C511-2007*	Reduced Pressure Principle Backflow Prevention Assembly	Backflow Protection
AWWA C900-2007*	Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 in. through 12 in. (100 mm through 300 mm), for Water Transmission and Distribution	Piping, Plastic

STANDARD NUMBER	STANDARD TITLE	APPLICATION
AWWA C901-2008*	Polyethylene (PE) Pressure Pipe and Tubing, 1/2 in. (13 mm) through 3 in. (76 mm), for Water Service	Piping, Plastic
AWWA C 904-2006*	Cross-linked Polyethylene (PEX) Pressure Pipe, 1/2 in. (12 mm) through 3 in. (76 mm), for Water Service	Piping, Plastic
BS EN 12975-1-2006	Thermal Solar Systems and Components — Solar Collectors (Part 1: General Requirements)	Collector
BS EN 12975-2-2006	Thermal Solar Systems and Components — Solar Collectors (Part 2: Test Methods)	Collector
BS EN 12976-1-2006	Thermal Solar Systems and Components — Factory-Made Systems (Part 1: General Requirements)	Solar System
BS EN 12976-2-2006	Thermal Solar Systems and Components — Factory-Made Systems (Part 2: Test Methods)	Solar System
BS EN ISO 9488-2000	Solar Energy — Vocabulary	Miscellaneous
CSA B64.1.1-2007	Atmospheric Vacuum Breakers (AVB)	Backflow Protection
CSA B64.1.2-2007	Pressure Vacuum Breakers (PVB)	Backflow Protection
CSA B64.2.1.1-2007	Hose Connection Dual Check Vacuum Breakers (HCDVB)	Backflow Protection
CSA B64.4-2007	Reduced Pressure Principle (RP) Backflow Preventers	Backflow Protection
CSA B64.4.1-2007	Reduced Pressure Principle Backflow Preventers for Fire Protection Systems (RPF)	Backflow Protection
CSA B64.5-2007	Double Check Valve (DVCA) Backflow Preventers	Backflow Protection
CSA B64.5.1-2007	Double Check Valve Backflow Preventers for Fire Protection Systems (DVCAF)	Backflow Protection
CSA B137.1-2009	Polyethylene (PE) Pipe, Tubing, and Fittings for Cold Water Pressure Services	Piping, Plastic
CSA B137.5-2009	Crosslinked Polyethylene (PEX) Tubing Systems for Pressure Applications	Piping, Plastic
CSA B137.9-2009	Polyethylene/Aluminum polyethylene (PE-AL-PE) Composite Pressure Pipe Systems	Piping, Plastic
CSA B137.10-2009	Crosslinked Polyethylene/Aluminum/Crosslinked Polyethylene (PEX-AL-PEX) Composite Pressure Pipe Systems	Piping, Plastic
CSA B137.11-2009	Polypropylene (PP-R) Pipe and Fittings for Pressure Applications	Piping, Plastic
CSA Z21.10.1a-2009*	Gas Water Heaters—Volume I, Storage Water Heaters with Input Ratings of 75 000 Btu Per Hour or Less (same as CSA 4.1a)	Fuel Gas, Appliances
CSA Z21.10.3b-2008 (R2010)*	Gas Water Heaters—Volume III, Storage Water Heaters with Input Ratings Above 75 000 Btu Per Hour, Circulating and Instantaneous (same as CSA 4.3b)	Fuel Gas, Appliances
CSA Z21.13a-2010*	Gas-Fired Low-Pressure Steam and Hot Water Boiler (same as CSA 4.9a)	Fuel Gas, Appliances
CSA Z21.22b-2001 (R2008)*	Relief Valves for Hot Water Supply Systems (same as CSA 4.4b)	Valves
CSA Z21.24a-2009*	Connectors for Gas Appliances (same as CSA 6.10a)	Fuel Gas

STANDARD NUMBER	STANDARD TITLE	APPLICATION
CSA Z21.56a-2008*	Gas-Fired Pool Heaters (same as CSA 4.7a)	Fuel Gas, Swimming Pools and Spas, and Hot Tubs
DD ENV 12977-1-2001	Thermal Solar Systems and Components — Custom-Built Systems (Part 1: General Requirements)	Solar System
DD ENV 12977-2-2001	Thermal Solar Systems and Components — Custom-Built Systems (Part 2: Test Methods)	Solar System
DD ENV 12977-3-2001	Thermal Solar Systems and Components — Custom-Built Systems (Part 3: Performance Characterization of Stores for Solar Heating Systems)	Solar System
IAPMO IS 8-2006	PVC Cold Water Building Supply and Yard Piping	Piping, Plastic
IAPMO IS 13-2006	Protectively Coated Pipe	Pipe Coatings
IAPMO IS 20-2010	CPVC Solvent Cemented Hot and Cold Water Distribution Systems	Piping, Plastic
IAPMO PS 25-2002	Metallic Fittings for Joining Polyethylene Pipe for Water Service and Yard Piping	Joints
IAPMO PS 64-2007a	Pipe Flashings	Miscellaneous
IAPMO PS 72-2007	Valves with Atmospheric Vacuum Breakers	Valves
IAPMO PS 117-2008	Copper and Copper Alloy Tubing System Incorporating Press-Type or Nail-Type Connections	Fittings
IEEE 937-2007	Installation and Maintenance of Lead-Acid Batteries for Photovoltaic (PV) Systems	Installation and Maintenance, Photovoltaic
IEEE 1013-2007	Sizing Lead-Acid Batteries for Stand-Alone Photovoltaic (PV) Systems	Photovoltaic, Sizing
IEEE 1361-2003	Lead-Acid Batteries Used in Stand-Alone Photovoltaic (PV) Systems	Testing, Evaluation
IEEE 1526-2003	Testing the Performance of Stand-Alone Photovoltaic Systems	Testing, Photovoltaic
IEEE 1547-2003	Interconnecting Distributed Resources with Electric Power Systems	Connections, Photovoltaic
IEEE 1562-2007	Array and Battery Sizing in Stand-Alone Photovoltaic (PV) Systems	Array, Battery, Photovoltaic
IEEE 1661-2007	Lead-Acid Batteries Used in Photovoltaic (PV) Hybrid Power Systems	Testing and Evaluation, Photovoltaic
ISO 9459-1-1993	Solar Heating — Domestic Water Heating Systems — Part 1	Solar System
ISO 9459-2-1995	Solar Heating — Domestic Water Heating Systems	Solar System
ISO 9806-1-1994	Test Methods for Solar Collectors — Part 1	Collector
ISO 9806-2-1995	Test Methods for Solar Collectors — Part 2	Collector
ISO 9806-3-1995	Test Methods for Solar Collectors — Part 3	Collector
ISO TR 10217-1989	Solar Energy — Water Heating Systems — Guide to Material Selection with Regard to Internal Corrosion	Solar System
MSS SP-58-2009	Pipe Hangers and Supports — Materials, Design, Manufacture, Selection, Application, and Installation	Fuel Gas
MSS SP-80-2008*	Bronze Gate, Globe, Angle, and Check Valves	Valves
NFPA 70-2011*	National Electrical Code	Electrical
NFPA 274-2009*	Test Method to Evaluate Fire Performance Characteristics of Pipe Insulation	Pipe Insulation

STANDARD NUMBER	STANDARD TITLE	APPLICATION
NSF 14-2010*	Plastic Piping System Components and Related Materials	Piping, Plastic
NSF 61-2010a*	Drinking Water System Components — Health Effects	Water Supply Components
SAE J512-1997	Automotive Tube Fittings	Fittings
SRCC 100-2005	Operating Guidelines for Certifying Solar Collectors	Collectors
SRCC 150-2008	Test Methods and Minimum Standards for Certifying Innovative Solar Collectors	Testing
SRCC 300-2008	Operating Guidelines and Minimum Standards for Certifying Solar Water Heating Systems	Solar System
UL 174-2004*	Household Electric Storage Tank Water Heaters (with revisions through April 22, 2009)	Appliances
UL 723-2008*	Test for Surface Burning Characteristics of Building Materials (with revisions through September 13, 2010)	Miscellaneous
UL 778-2010*	Motor-Operated Water Pumps (with revisions through August 25, 2011)	Pumps
UL 873-2007	Temperature-Indicating and -Regulating Equipment (with revisions through January 6, 2010)	Electrical
UL 916-2007	Energy Management Equipment (with revisions through June 4, 2010)	Electrical
UL 969-1995*	Safety Marking and Labeling System (with revisions through November 24, 2008)	Marking, Labeling
UL 1279-2010	Outline of Investigation for Solar Collectors	Electrical
UL 1453-2004*		
	Electric Booster and Commercial Storage Tank Water Heaters (with revisions through December 4, 2009)	Appliances
UL 1703-2002*	Flat-Plate Photovoltaic Modules and Panels (with revisions through May 23, 2011)	Electrical
UL 1741-2010	Inverters, Converters, Controllers and Interconnection System Equipment for Use With Distributed Energy Resources	Electrical
UL 4703-2010	Outline of Investigation for Photovoltaic Wire	Electrical
UL 6703-2010	Outline for Connectors for Use in Photovoltaic Systems	Electrical
UL 8703-2008	Outline for Concentrator Photovoltaic Modules and Assemblies	Electrical
UL 60730-1A-2002	Automatic Electrical Controls for Household and Similar Use, Part 1: General Requirements	Electrical

* ANSI designated as an American National Standard.

Notes:

- 1 Although this standard is referenced in Table S-17, some of the pipe, tubing, fittings, valves, or fixtures included in the standard are not acceptable for use under the provisions of the Uniform Plumbing Code.
- 2 See Section 605.3.4 and Section 705.5.3 for restrictions.
- 3 Alloy C85200 for cleanout plugs.
- 4 Standards for materials, equipment, joints and connections. Where more than one standard has been listed for the same material or method, the relevant portions of all such standards shall apply.

<u>STANDARD NUMBER</u>	<u>STANDARD TITLE</u>	<u>APPLICATION</u>
<u>AHRI 870-2005*</u>	<u>Performance Rating of Direct GeoExchange Heat Pumps</u>	<u>Equipment</u>
<u>ASCE 25-2006*</u>	<u>Earthquake-Actuated Automatic Gas Shutoff Devices</u>	<u>Fuel Gas</u>
<u>ASHRAE 34-2013*</u>	<u>Designation and Safety Classification of Refrigerants</u>	<u>Refrigerant Classifications</u>
<u>ASHRAE 90.1-2013*</u>	<u>Energy Standard for Buildings Except Low-Rise Residential Buildings</u>	<u>Energy</u>
<u>ASHRAE 93-2010 (RA2014)*</u>	<u>Methods of Testing to Determine the Thermal Performance of Solar Collectors</u>	<u>Testing</u>
<u>ASHRAE 95-1981 (RA1987)*</u>	<u>Methods of Testing to Determine the Thermal Performance of Solar Domestic Water Heating Systems</u>	<u>Testing</u>
<u>ASHRAE 96-1980 (RA1989)*</u>	<u>Thermal Performance of Unglazed Flat-Plate Liquid- Type Solar Collectors</u>	<u>Testing, Collector</u>
<u>ASME A13.1-2007 (R2013)*</u>	<u>Scheme for the Identification of Piping Systems</u>	<u>Piping</u>
<u>ASME A112.18.1-2012/CSA B125.1-2012</u>	<u>Plumbing Supply Fittings</u>	<u>Fittings</u>
<u>ASME A112.18.2-2011/CSA B125.2-2011</u>	<u>Plumbing Waste Fittings</u>	<u>Fittings</u>
<u>ASME A112.18.6-2009/CSA B125.6-2009 (R2014)*</u>	<u>Flexible Water Connectors</u>	<u>Piping</u>
<u>ASME B1.20.1-2013*</u>	<u>Pipe Threads, General Purpose (Inch)</u>	<u>Joints</u>
<u>ASME B16.3-2011*</u>	<u>Malleable Iron Threaded Fittings: Classes 150 and 300</u>	<u>Fittings</u>
<u>ASME B16.5-2013*</u>	<u>Pipe Flanges and Flanged Fittings: NPS ½ through NPS 24 Metric/Inch</u>	<u>Fittings</u>
<u>ASME B16.9-2012*</u>	<u>Factory-Made Wrought Butt Welding Fittings</u>	<u>Fittings</u>
<u>ASME B16.11-2011*</u>	<u>Forged Fittings, Socket-Welding and Threaded</u>	<u>Fittings</u>
<u>ASME B16.12-2009*</u>	<u>Cast Iron Threaded Drainage Fittings</u>	<u>Fittings</u>
<u>ASME B16.15-2013*</u>	<u>Cast Copper Alloy Threaded Fittings: Classes 125 and 250</u>	<u>Fittings</u>
<u>ASME B16.18-2012*</u>	<u>Cast Copper Alloy Solder Joint Pressure Fittings</u>	<u>Fittings</u>
<u>ASME B16.21-2011*</u>	<u>Nonmetallic Flat Gaskets for Pipe Flanges</u>	<u>Joints</u>
<u>ASME B16.22-2013*</u>	<u>Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings</u>	<u>Fittings</u>
<u>ASME B16.23-2011*</u>	<u>Cast Copper Alloy Solder Joint Drainage Fittings: DWV</u>	<u>Fittings</u>
<u>ASME B16.24-2011*</u>	<u>Cast Copper Alloy Pipe Flanges and Flanged Fittings: Classes 150, 300, 600, 900, 1500, and 2500</u>	<u>Fittings</u>
<u>ASME B16.26-2013*</u>	<u>Cast Copper Alloy Fittings for Flared Copper Tubes</u>	<u>Fittings</u>
<u>ASME B16.29-2012*</u>	<u>Wrought Copper and Wrought Copper Alloy Solder- Joint Drainage Fittings - DWV</u>	<u>Fittings</u>
<u>ASME B16.33-2012*</u>	<u>Manually Operated Metallic Gas Valves for Use in Gas Piping Systems Up to 175 psi (Sizes NPS ½ – NPS 2)</u>	<u>Valves</u>

<u>STANDARD NUMBER</u>	<u>STANDARD TITLE</u>	<u>APPLICATION</u>
<u>ASME B16.34-2013*</u>	<u>Valves – Flanged, Threaded, and Welding End</u>	<u>Valves</u>
<u>ASME B16.47-2011*</u>	<u>Large Diameter Steel Flanges: NPS 26 Through NPS 60 Metric/Inch</u>	<u>Fittings</u>
<u>ASME B16.51-2013*</u>	<u>Copper and Copper Alloy Press-Connect Pressure Fittings</u>	<u>Fittings</u>
<u>ASME BPVC Section IV-2013*</u>	<u>Rules for Construction of Heating Boilers</u>	<u>Miscellaneous</u>
<u>ASME BPVC Section VIII-2013*</u>	<u>Rules for Construction of Pressure Vessels Division 1</u>	<u>Miscellaneous</u>
<u>ASME BPVC Section IX-2013*</u>	<u>Welding, Brazing, and Fusing Qualifications</u>	<u>Certification</u>
<u>ASME BPVC Section X-2013*</u>	<u>Fiber-Reinforced Plastic Pressure Vessels</u>	<u>Pressure Vessel Construction, Pressure Vessels</u>
<u>ASME SA194-2013*</u>	<u>Carbon and Alloy Steel Nuts for Bolts for High-Pressure or High-Temperature Service, or Both</u>	<u>Mounting</u>
<u>ASSE 1001-2008*</u>	<u>Atmospheric Type Vacuum Breakers</u>	<u>Backflow Protection</u>
<u>ASSE 1010-2004*</u>	<u>Water Hammer Arresters</u>	<u>Water Supply Component</u>
<u>ASSE 1017-2009*</u>	<u>Temperature Actuated Mixing Valves for Hot Water Distribution Systems</u>	<u>Valves</u>
<u>ASSE 1018-2001*</u>	<u>Trap Seal Primer Valves–Potable Water Supplied</u>	<u>Valves</u>
<u>ASSE 1061-2011*</u>	<u>Push-Fit Fittings</u>	<u>Fittings</u>
<u>ASSE 1079-2012</u>	<u>Dielectric Pipe Unions</u>	<u>Joints</u>
<u>ASTM A53/A53M-2012</u>	<u>Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless</u>	<u>Piping, Ferrous</u>
<u>ASTM A74-2013a</u>	<u>Cast Iron Soil Pipe and Fittings</u>	<u>Piping, Ferrous</u>
<u>ASTM A106/A106M-2014</u>	<u>Seamless Carbon Steel Pipe for High-Temperature Service</u>	<u>Piping, Ferrous</u>
<u>ASTM A126-2004 (R2014)</u>	<u>Gray Iron Castings for Valves, Flanges, and Pipe Fittings</u>	<u>Piping, Ferrous</u>
<u>ASTM A254/A254M-2012</u>	<u>Copper-Brazed Steel Tubing</u>	<u>Piping, Ferrous</u>
<u>ASTM A269/A269M-2014^{e1}</u>	<u>Seamless and Welded Austenitic Stainless Steel Tubing for General Service</u>	<u>Piping, Ferrous</u>
<u>ASTM A312/A312M-2014</u>	<u>Seamless, Welded, and Heavily Cold Worked Austenitic Stainless Steel Pipes</u>	<u>Piping, Ferrous</u>
<u>ASTM A377-2003 (R2008)^{e1}</u>	<u>Ductile-Iron Pressure Pipe</u>	<u>Piping, Ferrous</u>
<u>ASTM A420/A420M-2013</u>	<u>Piping Fittings of Wrought Carbon Steel and Alloy Steel for Low-Temperature Service</u>	<u>Fittings</u>
<u>ASTM A518/A518M-1999 (R2012)</u>	<u>Corrosion-Resistant High-Silicon Iron Castings</u>	<u>Piping, Ferrous</u>
<u>ASTM A733-2013</u>	<u>Welded and Seamless Carbon Steel and Austenitic Stainless Steel Pipe Nipples</u>	<u>Piping, Ferrous</u>
<u>ASTM A861-2004 (R2013)</u>	<u>High-Silicon Iron Pipe and Fittings (Note 1)</u>	<u>Piping, Ferrous</u>
<u>ASTM B32-2008</u>	<u>Solder Metal (Note 2)</u>	<u>Joints</u>
<u>ASTM B42-2010</u>	<u>Seamless Copper Pipe, Standard Sizes</u>	<u>Piping, Copper Alloy</u>
<u>ASTM B43-2014</u>	<u>Seamless Red Brass Pipe, Standard Sizes</u>	<u>Piping, Copper Alloy</u>
<u>ASTM B75/B75M-2011</u>	<u>Seamless Copper Tube</u>	<u>Piping, Copper Alloy</u>
<u>ASTM B88-2009</u>	<u>Seamless Copper Water Tube</u>	<u>Piping, Copper Alloy</u>
<u>ASTM B135-2010</u>	<u>Seamless Brass Tube</u>	<u>Piping, Copper Alloy</u>
<u>ASTM B251-2010</u>	<u>General Requirements for Wrought Seamless Copper and Copper-Alloy Tube</u>	<u>Piping, Copper Alloy</u>

<u>ASTM B280-2013</u>	<u>Seamless Copper Tube for Air Conditioning and Refrigeration Field Service</u>	<u>Piping, Ferrous</u>
<u>ASTM B302-2012</u>	<u>Threadless Copper Pipe, Standard Sizes</u>	<u>Piping, Copper Alloy</u>

<u>STANDARD NUMBER</u>	<u>STANDARD TITLE</u>	<u>APPLICATION</u>
<u>ASTM B306-2013</u>	<u>Copper Drainage Tube (DWV)</u>	<u>Piping, Copper Alloy</u>
<u>ASTM B447-2012a</u>	<u>Welded Copper Tube</u>	<u>Piping, Copper Alloy</u>
<u>ASTM B584-2014</u>	<u>Copper Alloy Sand Castings for General Applications (Note</u>	<u>Piping, Copper Alloy</u>
<u>ASTM B587-2012</u>	<u>Welded Brass Tube</u>	<u>Piping, Copper Alloy</u>
<u>ASTM B687-1999 (R2011)</u>	<u>Brass, Copper, and Chromium-Plated Pipe Nipples</u>	<u>Piping, Copper Alloy</u>
<u>ASTM B813-2010</u>	<u>Liquid and Paste Fluxes for Soldering of Copper and Copper Alloy Tube</u>	<u>Joints</u>
<u>ASTM B828-2002 (R2010)</u>	<u>Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings</u>	<u>Joints</u>
<u>ASTM C411-2011</u>	<u>Hot-Surface Performance of High-Temperature Thermal Insulation</u>	<u>Block Board, Cracking, Delamination, Hot- Surface Performance, Pipe Thermal Insulation, Surface Analysis- Building, Temperature Tests- Insulation, Thermal Insulating Materials</u>
<u>ASTM C425-2004 (R2013)</u>	<u>Compression Joints for Vitrified Clay Pipe and Fittings</u>	<u>Joints</u>
<u>ASTM C443-2012</u>	<u>Joints for Concrete Pipe and Manholes, Using Rubber</u>	<u>Joints</u>
<u>ASTM C564- 2014</u>	<u>Rubber Gaskets for Cast Iron Soil Pipe and Fittings</u>	<u>Joints</u>
<u>ASTM C700-2013</u>	<u>Vitrified Clay Pipe, Extra Strength, Standard Strength, and Perforated</u>	<u>Piping, Non-Metallic</u>
<u>ASTM C1277-2014</u>	<u>Shielded Couplings Joining Hubless Cast Iron Soil Pipe and Fittings</u>	<u>Joints</u>
<u>ASTM D56-2005 (R2010)</u>	<u>Flash Point by the Tag Closed Cup Tester</u>	<u>Testing</u>
<u>ASTM D93-2013¹</u>	<u>Flash Point by Pensky-Martens Closed Cup Tester</u>	<u>Testing</u>
<u>ASTM D635-2010</u>	<u>Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position</u>	<u>Testing</u>
<u>ASTM D1527-1999 (R2005)*</u>	<u>Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe, Schedules 40 and 80</u>	<u>Piping, Plastic</u>
<u>ASTM D1693-2013</u>	<u>Environmental Stress-Cracking of Ethylene Plastics</u>	<u>Piping, Plastic</u>
<u>ASTM D1785-2012*</u>	<u>Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120</u>	<u>Piping, Plastic</u>
<u>ASTM D2235-2004 (R2011)*</u>	<u>Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings</u>	<u>Joints</u>
<u>ASTM D2241-2009*</u>	<u>Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR</u>	<u>Piping, Plastic</u>
<u>ASTM D2464-2013*</u>	<u>Threaded Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80 (Note 1)</u>	<u>Fittings</u>
<u>ASTM D2466-2013*</u>	<u>Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40 (Note 1)</u>	<u>Fittings</u>
<u>ASTM D2467-2013a*</u>	<u>Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80 (Note 1)</u>	<u>Fittings</u>
<u>ASTM D2513-2014*</u>	<u>Polyethylene (PE) Gas Pressure Pipe, Tubing, and Fittings (Note 1)</u>	<u>Piping, Plastic</u>

<u>ASTM D2564-2012*</u>	<u>Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems</u>	<u>Joints</u>
<u>ASTM D2609-2002 (R2008)*</u>	<u>Plastic Insert Fittings for Polyethylene (PE) Plastic Pipe (Note</u>	<u>Fittings</u>
<u>ASTM D2672-1996a (R2009)*</u>	<u>Joints for IPS PVC Pipe Using Solvent Cement</u>	<u>Joints</u>
<u>ASTM D2683-2010 ^{c3*}</u>	<u>Socket-Type Polyethylene Fittings for Outside Diameter- Controlled Polyethylene Pipe and Tubing</u>	<u>Fittings</u>
<u>ASTM D2837-2013^{cl}</u>	<u>Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials or Pressure Design Basis for Thermoplastic Pipe Products</u>	<u>Piping, Plastic</u>

<u>STANDARD NUMBER</u>	<u>STANDARD TITLE</u>	<u>APPLICATION</u>
<u>ASTM D2846/D2846M-2009b^{cl*}</u>	<u>Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Hot- and Cold-Water Distribution Systems</u>	<u>Piping, Plastic</u>
<u>ASTM D2855-1996 (R2010)*</u>	<u>Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings</u>	<u>Joints</u>
<u>ASTM D3035-2014*</u>	<u>Polyethylene (PE) Plastic Pipe (DR-PR) Based on Controlled Outside Diameter</u>	<u>Piping, Plastic</u>
<u>ASTM D3139-1998 (R2011)*</u>	<u>Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals</u>	<u>Joints</u>
<u>ASTM D3261-2012^{cl*}</u>	<u>Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing</u>	<u>Fittings</u>
<u>ASTM D3278-1996 (R2011)</u>	<u>Flash Point of Liquids by Small Scale Closed-Cup</u>	<u>Testing</u>
<u>ASTM D3350-2012^{cl}</u>	<u>Polyethylene Plastics Pipe and Fittings Materials</u>	<u>Piping, Plastic</u>
<u>ASTM E84-2014*</u>	<u>Surface Burning Characteristics of Building Materials</u>	<u>Miscellaneous</u>
<u>ASTM E136-2012*</u>	<u>Behavior of Materials in a Vertical Tube Furnace at 750°C</u>	<u>Furnace</u>
<u>ASTM E2231-2014*</u>	<u>Specimen Preparation and Mounting of Pipe and Duct Insulation Materials to Assess Surface Burning</u>	<u>Miscellaneous</u>
<u>ASTM F437-2009*</u>	<u>Threaded Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80</u>	<u>Fittings</u>
<u>ASTM F438-2009*</u>	<u>Socket-Type Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 40</u>	<u>Fittings</u>
<u>ASTM F439-2013*</u>	<u>Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80</u>	<u>Fittings</u>
<u>ASTM F441/F441M-2013^{cl*}</u>	<u>Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe, Schedules 40 and 80</u>	<u>Piping, Plastic</u>
<u>ASTM F442/F442M-2013^{cl*}</u>	<u>Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe (SDR- PR)</u>	<u>Piping, Plastic</u>
<u>ASTM F480-2014*</u>	<u>Thermoplastic Well Casing Pipe and Couplings Made in Standard Dimension Ratios (SDR), SCH 40 and SCH 80</u>	<u>Piping, Plastic</u>
<u>ASTM F493-2010*</u>	<u>Solvent Cements for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe and Fittings</u>	<u>Joints</u>
<u>ASTM F628-2012^{cl*}</u>	<u>Acrylonitrile-Butadiene-Styrene (ABS) Schedule 40 Plastic Drain, Waste, and Vent Pipe with a Cellular Core</u>	<u>Piping, Plastic</u>
<u>ASTM F656-2010*</u>	<u>Primers for Use in Solvent Cement Joints of Poly (Vinyl Chloride) (PVC) Plastic Pipe and Fittings</u>	<u>Joints</u>
<u>ASTM F714-2013*</u>	<u>Polyethylene (PE) Plastic Pipe (DR-PR) Based on Outside Diameter</u>	<u>Piping, Plastic</u>
<u>ASTM F876-2013a*</u>	<u>Crosslinked Polyethylene (PEX) Tubing</u>	<u>Piping, Plastic</u>

<u>ASTM F877-2011a*</u>	<u>Crosslinked Polyethylene (PEX) Plastic Hot- and Cold-Water Distribution Systems</u>	<u>Piping, Plastic</u>
<u>ASTM F891-2010*</u>	<u>Coextruded Poly(Vinyl Chloride) (PVC) Plastic Pipe with a Cellular Core</u>	<u>Piping, Plastic</u>
<u>ASTM F1055-2013*</u>	<u>Electrofusion Type Polyethylene Fittings for Outside Diameter Controlled Polyethylene and Crosslinked Polyethylene (PEX) Pipe and Tubing</u>	<u>Fittings</u>
<u>ASTM F1281-2011*</u>	<u>Crosslinked Polyethylene/Aluminum/Crosslinked</u>	<u>Piping, Plastic</u>
<u>ASTM F1282-2010*</u>	<u>Polyethylene/Aluminum/Polyethylene (PE-AL-PE) Composite Pressure Pipe</u>	<u>Piping, Plastic</u>
<u>ASTM F1807-2013a*</u>	<u>Metal Insert Fittings Utilizing a Copper Crimp Ring for SDR9 Cross-linked Polyethylene (PEX) Tubing and SDR9 Polyethylene of Raised Temperature (PE-RT) Tubing</u>	<u>Fittings</u>

<u>STANDARD NUMBER</u>	<u>STANDARD TITLE</u>	<u>APPLICATION</u>
<u>ASTM F1960-2012*</u>	<u>Cold Expansion Fittings with PEX Reinforcing Rings for Use with Cross-linked Polyethylene (PEX) Tubing</u>	<u>Fittings</u>
<u>ASTM F1961-2009*</u>	<u>Metal Mechanical Cold Flare Compression Fittings with Disc Spring for Crosslinked Polyethylene (PEX) Tubing</u>	<u>Fittings</u>
<u>ASTM F1970-2012^{el}*</u>	<u>Special Engineered Fittings, Appurtenances or Valves for Use in Poly (Vinyl Chloride) (PVC) or Chlorinated Poly (Vinyl Chloride) (CPVC) Systems</u>	<u>Piping, Plastic</u>
<u>ASTM F1974-2009*</u>	<u>Metal Insert Fittings for Polyethylene/Aluminum/Polyethylene and Crosslinked Polyethylene/Aluminum/Crosslinked Polyethylene</u>	<u>Fittings</u>
<u>ASTM F2080-2012*</u>	<u>Cold-Expansion Fittings with Metal Compression-Sleeves for Cross-Linked Polyethylene (PEX) Pipe</u>	<u>Fittings</u>
<u>ASTM F2159-2011*</u>	<u>Plastic Insert Fittings Utilizing a Copper Crimp Ring for SDR9 Cross-linked Polyethylene (PEX) Tubing and SDR9 Polyethylene of Raised Temperature (PE-RT)</u>	<u>Joints</u>
<u>ASTM F2262-2009*</u>	<u>Crosslinked Polyethylene/Aluminum/Crosslinked</u>	<u>Piping, Plastic</u>
<u>ASTM F2389-2010</u>	<u>Pressure-Rated Polypropylene (PP) Piping Systems</u>	<u>Piping, Plastic</u>
<u>ASTM F2434-2009*</u>	<u>Metal Insert Fittings Utilizing a Copper Crimp Ring for SDR9 Cross-linked Polyethylene (PEX) Tubing and SDR9 Cross-linked Polyethylene/Aluminum/Cross-linked Polyethylene (PEX-AL-PEX) Tubing</u>	<u>Pipe Fittings</u>
<u>ASTM F2620-2013*</u>	<u>Standard Practice for Heat Fusion Joining of Polyethylene Pipe and Fittings</u>	<u>Joints</u>
<u>ASTM F2623-2008*</u>	<u>Polyethylene of Raised Temperature (PE-RT) SDR9 Tubing</u>	<u>Piping, Plastic</u>
<u>ASTM F2735-2009*</u>	<u>Plastic Insert Fittings for SDR9 Cross-linked Polyethylene (PEX) and Polyethylene of Raised Temperature (PE-RT) Tubing</u>	<u>Fittings</u>
<u>ASTM F2769-2010*</u>	<u>Polyethylene of Raised Temperature (PE-RT) Plastic Hot and Cold-Water Tubing and Distribution Systems</u>	<u>Piping and Fittings, Plastic</u>
<u>AWS A5.8M/A5.8-2011*</u>	<u>Filler Metals for Brazing and Braze Welding</u>	<u>Joints</u>
<u>AWS B2.2/B2.2M-2010*</u>	<u>Brazing Procedure and Performance Qualification</u>	<u>Certification</u>
<u>AWWAC110-2012*</u>	<u>Ductile-Iron and Gray-Iron Fittings</u>	<u>Fittings</u>

<u>AWWAC111-2012*</u>	<u>Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings (same as ANSI A21.11)</u>	<u>Joints</u>
<u>AWWAC115-2011*</u>	<u>Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges</u>	<u>Piping</u>
<u>AWWAC151-2009*</u>	<u>Ductile-Iron Pipe, Centrifugally Cast</u>	<u>Piping, Ferrous</u>
<u>AWWAC153-2011*</u>	<u>Ductile-Iron Compact Fittings</u>	<u>Fittings</u>
<u>AWWAC203-2008*</u>	<u>Coal-Tar Protective Coatings and Linings for Steel Water Pipelines—Enamel and Tape—Hot Applied</u>	<u>Miscellaneous</u>
<u>AWWAC213-2007*</u>	<u>Fusion-Bonded Epoxy Coating for the Interior and Exterior of Steel Water Pipelines</u>	<u>Miscellaneous</u>
<u>AWWAC215-2010*</u>	<u>Extruded Polyolefin Coatings for the Exterior of Steel Water Pipeline</u>	<u>Miscellaneous</u>
<u>AWWAC500-2009*</u>	<u>Metal-Seated Gate Valves for Water Supply Service</u>	<u>Valves</u>
<u>AWWAC507-2011*</u>	<u>Ball Valves, 6 in. through 60 in. (150 mm through 1,500</u>	<u>Valves</u>
<u>BS EN 12975-1-2006 (R2010)</u>	<u>Thermal Solar Systems and Components – Solar Collectors – Part 1: General Requirements</u>	<u>Collector</u>
<u>BS EN 12975-2-2006</u>	<u>Thermal Solar Systems and Components – Solar Collectors – Part 2: Test Methods</u>	<u>Collector</u>

<u>STANDARD NUMBER</u>	<u>STANDARD TITLE</u>	<u>APPLICATION</u>
<u>BS EN 12976-1-2006</u>	<u>Thermal Solar Systems and Components – Factory Made Systems – Part 1: General Requirements</u>	<u>Solar System</u>
<u>BS EN 12976-2-2006</u>	<u>Thermal Solar Systems and Components – Factory Made Systems – Part 2: Test Methods</u>	<u>Solar System</u>
<u>BS EN ISO 9488-2000</u>	<u>Solar Energy – Vocabulary</u>	<u>Miscellaneous</u>
<u>CSA B137.1-2013</u>	<u>Polyethylene (PE) Pipe, Tubing, and Fittings for Cold-Water Pressure Services</u>	<u>Piping, Plastic</u>
<u>CSA B137.5-2013</u>	<u>Crosslinked Polyethylene (PEX) Tubing Systems for Pressure Applications</u>	<u>Piping, Plastic</u>
<u>CSA B137.9-2013</u>	<u>Polyethylene/Aluminum/Polyethylene (PE-AL-PE) Composite Pressure-Pipe Systems</u>	<u>Piping, Plastic</u>
<u>CSA B137.10-2013</u>	<u>Crosslinked Polyethylene/Aluminum/Crosslinked Polyethylene (PEX-AL-PEX) Composite Pressure-Pipe</u>	<u>Piping, Plastic</u>
<u>CSA B137.11-2013</u>	<u>Polypropylene (PP-R) Pipe and Fittings for Pressure Applications</u>	<u>Piping, Plastic</u>
<u>CSA Z21.10.1-2013*</u>	<u>Gas Water Heaters -Volume I, Storage Water Heaters with Input Ratings of 75,000 Btu Per Hour or Less (same as CSA</u>	<u>Fuel Gas, Appliances</u>
<u>CSA Z21.10.3-2013*</u>	<u>Gas-Fired Water Heaters -Volume III, Storage Water Heaters with Input Ratings Above 75,000 Btu Per Hour, Circulating and Instantaneous (same as CSA 4.3)</u>	<u>Fuel Gas, Appliances</u>
<u>CSA Z21.13-2014*</u>	<u>Gas-Fired Low Pressure Steam and Hot Water Boilers (same as CSA 4.9)</u>	<u>Fuel Gas, Appliances</u>
<u>CSA Z21.22b-2001 (R2008)*</u>	<u>Relief Valves for Hot Water Supply Systems (same as CSA 4.4b)</u>	<u>Valves</u>
<u>CSA Z21.24a-2009 (R2011)*</u>	<u>Connectors for Gas Appliances (same as CSA 6.10a)</u>	<u>Fuel Gas</u>
<u>CSA Z21.56-2014*</u>	<u>Gas-Fired Pool Heaters (same as CSA 4.7)</u>	<u>Fuel Gas, Swimming Pools and Spas, and Hot Tubs</u>
<u>IAPMO IS 8-2006</u>	<u>PVC Cold Water Building Supply and Yard Piping</u>	<u>Piping, Plastic</u>
<u>IAPMO IS 13-2006</u>	<u>Protectively Coated Pipe</u>	<u>Pipe Coatings</u>
<u>IAPMO IS 20-2010^{cl}</u>	<u>CPVC Solvent Cemented Hot and Cold Water Distribution Systems</u>	<u>Piping, Plastic</u>
<u>IAPMO PS 25-2002</u>	<u>Metallic Fittings for Joining Polyethylene Pipe for Water Service and Yard Piping</u>	<u>Joints</u>

<u>IAPMO PS 64-2012a^{el}</u>	<u>Roof Pipe Flashings</u>	<u>Miscellaneous</u>
<u>IAPMO PS 72-2007^{el}</u>	<u>Valves with Atmospheric Vacuum Breakers</u>	<u>Valves</u>
<u>IAPMO PS-117-2012a^{el}</u>	<u>Press and Nail Connections</u>	<u>Fittings</u>
<u>IEEE 937-2007</u>	<u>Installation and Maintenance of Lead-Acid Batteries for Photovoltaic (PV) Systems</u>	<u>Installation and Maintenance, Photovoltaic</u>
<u>IEEE 1013-2007</u>	<u>Sizing Lead-Acid Batteries for Stand-Alone Photovoltaic (PV) Systems</u>	<u>Photovoltaic, Sizing</u>
<u>IEEE 1361-2003*</u>	<u>Lead-Acid Batteries Used in Stand-Alone Photovoltaic (PV) Systems</u>	<u>Testing, Evaluation</u>
<u>IEEE 1526-2003*</u>	<u>Testing the Performance of Stand-Alone Photovoltaic</u>	<u>Testing, Photovoltaic</u>
<u>IEEE 1547-2003</u>	<u>Interconnecting Distributed Resources with Electric Power Systems</u>	<u>Connections, Photovoltaic</u>
<u>IEEE 1562-2007</u>	<u>Array and Battery Sizing in Stand-Alone Photovoltaic (PV) Systems</u>	<u>Array, Battery, Photovoltaic</u>
<u>IEEE 1661-2007</u>	<u>Lead-Acid Batteries Used in Photovoltaic (PV) Hybrid Power Systems</u>	<u>Testing and Evaluation, Photovoltaic</u>
<u>MSS SP-58-2009*</u>	<u>Pipe Hangers and Supports – Materials, Design, Manufacture, Selection, Application, and Installation</u>	<u>Fuel Gas</u>
<u>MSS SP-80-2013</u>	<u>Bronze Gate, Globe, Angle, and Check Valves</u>	<u>Valves</u>
<u>NFPA 54/Z223.1-2012*</u>	<u>National Fuel Gas Code</u>	<u>Fuel Gas</u>

<u>STANDARD NUMBER</u>	<u>STANDARD TITLE</u>	<u>APPLICATION</u>
<u>NFPA 70-2014*</u>	<u>National Electrical Code</u>	<u>Electrical, Miscellaneous</u>
<u>NFPA 96-2014*</u>	<u>Ventilation Control and Fire Protection of Commercial Cooking Operations</u>	<u>Commercial Cooking</u>
<u>NFPA 262-2011*</u>	<u>Flame Travel and Smoke of Wires and Cables for Use in Air- Handling Spaces</u>	<u>Certification</u>
<u>NFPA 274-2013*</u>	<u>Test Method to Evaluate Fire Performance Characteristics of Pipe Insulation</u>	<u>Pipe Insulation</u>
<u>NGWA-01-2014*</u>	<u>Water Well Construction Standard</u>	<u>Geothermal</u>
<u>NSF 14-2013*</u>	<u>Plastic Piping System Components and Related Materials</u>	<u>Piping, Plastic</u>
<u>NSF 60-2013*</u>	<u>Drinking Water Treatment Chemicals-Health Effects</u>	<u>Backfill</u>
<u>NSF 61-2013*</u>	<u>Drinking Water System Components – Health Effects</u>	<u>Water Supply Components</u>
<u>SAE J512-1997</u>	<u>Automotive Tube Fittings</u>	<u>Fittings</u>
<u>SMACNA-2006*</u>	<u>HVAC Duct Construction Standards Metal and Flexible, 3rd edition</u>	<u>Ducts, Metal and Flexible</u>
<u>SRCC 100-2013</u>	<u>Solar Thermal Collectors</u>	<u>Collectors</u>
<u>SRCC 300-2013</u>	<u>Solar Water Heating Systems</u>	<u>Solar System</u>
<u>UL 174-2004*</u>	<u>Household Electric Storage Tank Water Heaters (with revisions through September 21, 2012)</u>	<u>Appliances</u>
<u>UL 181-2013*</u>	<u>Factory-Made Air Ducts and Air Connectors</u>	<u>Air Connectors, Air Ducts</u>
<u>UL 181A-2013*</u>	<u>Closure Systems for Use with Rigid Air Ducts</u>	<u>Air Ducts</u>

<u>UL 181B-2013*</u>	<u>Closure Systems for Use with Flexible Air Ducts and Air Connectors</u>	<u>Air Connectors, Air Ducts</u>
<u>UL 268A-2008*</u>	<u>Smoke Detectors for Duct Application (with revisions through September 25, 2009)</u>	<u>Smoke Detectors</u>
<u>UL 555-2006*</u>	<u>Fire Dampers (with revisions through November 5, 2013)</u>	<u>Dampers</u>
<u>UL 555C-2006*</u>	<u>Ceiling Dampers (with revisions through May 4, 2010)</u>	<u>Dampers</u>

<u>STANDARD NUMBER</u>	<u>STANDARD TITLE</u>	<u>APPLICATION</u>
<u>UL 555S-1999*</u>	<u>Smoke Dampers (with revisions through October 9, 2013)</u>	<u>Dampers</u>
<u>UL 723-2008*</u>	<u>Test for Surface Burning Characteristics of Building Materials (with revisions through August 12, 2013)</u>	<u>Miscellaneous</u>
<u>UL 778-2010*</u>	<u>Motor-Operated Water Pumps (with revisions through May 23, 2014)</u>	<u>Pumps</u>
<u>UL 834-2004*</u>	<u>Heating, Water Supply, and Power Boilers – Electric (with revisions through December 9, 2013)</u>	<u>Appliances</u>
<u>UL 873-2007</u>	<u>Temperature-Indicating and -Regulating Equipment (with revisions through August 15, 2013)</u>	<u>Electrical</u>
<u>UL 916-2007</u>	<u>Energy Management Equipment (with revisions through December 19, 2013)</u>	<u>Electrical</u>
<u>UL 969-1995*</u>	<u>Marking and Labeling System (with revisions through November 24, 2008)</u>	<u>Marking, Labeling</u>
<u>UL 1279-2010</u>	<u>Outline of Investigation for Solar Collectors</u>	<u>Electrical</u>
<u>UL 1453-2004*</u>	<u>Electric Booster and Commercial Storage Tank Water Heaters (with revisions through July 15, 2013)</u>	<u>Appliances</u>
<u>UL 1703-2002*</u>	<u>Flat-Plate Photovoltaic Modules and Panels (with revisions through October 25, 2013)</u>	<u>Electrical</u>
<u>UL 1741-2010</u>	<u>Inverters, Converters, Controllers and Interconnection System Equipment for Use With Distributed Energy Resources</u>	<u>Electrical</u>
<u>UL 1820-2004*</u>	<u>Fire Test of Pneumatic Tubing for Flame and Smoke Characteristics (with revisions through May 10, 2013)</u>	<u>Surface Burning Test, Pneumatic Tubing</u>
<u>UL 1887-2004*</u>	<u>Fire Test of Plastic Sprinkler Pipe for Visible Flame and Smoke Characteristics (with revisions through May 3, 2013)</u>	<u>Surface Burning Test, Fire Sprinkler Pipe</u>
<u>UL 2043-2013*</u>	<u>Fire Test for Heat and Visible Smoke Release for Discrete Products and their Accessories Installed in Air-Handling Spaces</u>	<u>Surface Burning Test, Discrete Products</u>
<u>UL 2523-2009*</u>	<u>Solid Fuel-Fired Hydronic Heating Appliances, Water Heaters, and Boilers (with revisions through February 8, 2013)</u>	<u>Appliances</u>
<u>UL 4703-2010</u>	<u>Outline of Investigation for Photovoltaic Wire</u>	<u>Electrical</u>
<u>UL 6703-2011</u>	<u>Outline of Investigation for Connectors for Use in Photovoltaic Systems</u>	<u>Electrical</u>
<u>UL 8703-2011</u>	<u>Outline of Investigation for Concentrator Photovoltaic Modules and Assemblies</u>	<u>Electrical</u>
<u>UL 60730-1 2009*</u>	<u>Automatic Electrical Controls for Household and Similar Use, Part 1: General Requirements (with revisions through November 13, 2013)</u>	<u>Electrical</u>

* ANSI designated as an American National Standard.

Notes:

¹ Although this standard is referenced in Table S17, some of the pipe, tubing, fittings, or valves included in the standard are not acceptable for use under the provisions of this Appendix.

² See Section 605.1 for restrictions.

³ Alloy C85200 for cleanout plugs.

⁴ Standards for materials, equipment, joints and connections. Where more than one standard has been listed for the same material or method, the relevant portions of all such standards shall apply.

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SECTION 21. The provisions of this ordinance contain various changes, modifications, and additions to the 2016 Edition of the California Plumbing Code. Some of these changes are administrative in nature in that they do not constitute changes or modifications to requirements contained in the building standards published in the California Building Standards Code.

Pursuant to California Health and Safety Code sections 17958.5, 17958.7, and 18941.5, the Board of Supervisors hereby expressly finds that all of the changes and modifications to requirements contained in the building standards published in the California Building Standards Code contained in this ordinance, that are not administrative in nature, are reasonably necessary because of local climatic, geological, or topographical conditions in the County of Los Angeles as more particularly described in the table set forth below.

PLUMBING CODE AMENDMENTS

CODE SECTION	CONDITION	EXPLANATION
Section 721.3	Geological, Topographical	To allow for the proper operation of existing Los Angeles County sewer infrastructure and establish consistency with Title 20 – Utilities – of the Los Angeles County Code, Division 2 (Sanitary Sewers and Industrial Waste) due to local soil conditions and topography.
Sections 728.1 to 728.6	Geological, Topographical	To allow for the proper operation of existing Los Angeles County sewer infrastructure and establish consistency with Title 20 – Utilities – of the Los Angeles County Code, Division 2 (Sanitary Sewers and Industrial Waste) due to local soil conditions and topography.
Table H 101.8	Geological, Topographical	To establish more restrictive requirements for protection of local groundwater due to local soil conditions and to provide protections for native, protected oak trees that are consistent with Title 22 – Zoning and Planning – of the Los Angeles County Code, Chapter 22.56, Part 16 (Oak Tree Permits).
Table H 201.1(1)	Geological, Topographical	To establish more restrictive requirements for protection of local groundwater due to local soil conditions, sewer capacity, and sewage treatment.
Table H 201.1(2)	Geological, Topographical	To establish consistency with requirements of the County Health Department for sewer capacity and sewage treatment due to local soil conditions.
Table H 201.1(3)	Geological, Topographical	To establish consistency with requirements of the County Health Department for sewer capacity and sewage treatment due to local soil conditions.
Table H 201.1(4)	Geological, Topographical	To establish consistency with requirements of the County Health Department for sewer capacity and sewage treatment due to local soil conditions.
Section H 301.1	Geological, Topographical	To establish more restrictive requirements for protection of local groundwater due to local soil conditions.

CODE SECTION	CONDITION	EXPLANATION
Section H 401.3	Geological, Topographical	To establish more restrictive requirements for protection of local groundwater due to local soil conditions.
Section H 601.5	Geological, Topographical	To establish more restrictive requirements for protection of local groundwater due to local soil conditions.
Section H 601.8	Geological, Topographical	To establish more restrictive requirements for protection of local groundwater due to local soil conditions.
Section H 701.2	Geological, Topographical	To establish more restrictive requirements for protection of local groundwater due to local soil conditions.
Section H 1001.1	Geological	To establish more restrictive requirements to prevent earth movement based on local soil and seismic conditions.
Section H 1101.6	Geological	To establish more restrictive requirements to prevent earth movement based on local soil and seismic conditions.

SECTION 24. This ordinance shall become operative on January 1, 2017.

[TITLE282016CSCC]